

DESIGN COMPATIBILITY GUIDELINES

NELLIS AIR FORCE BASE NEVADA

AUGUST 2006



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SECTION 1.0

Executive Summary

Nellis AFB currently consists of six clearly distinguishable districts:

- Mixed Use Central Core
- Flight Line
- Facilities Engineering
- Residential Neighborhoods,
- Recreational Areas
- Area II

Creech AFB at Indian Springs, Nevada, a separate unit under Nellis Command, is also included in the Guidelines as an individual district. Each district is functionally distinct and, consequently, each district has unique physical characteristics. While some of the districts are already in the process of developing coherent design standards (e.g., the residential neighborhoods), others (e.g. the Mixed Use Central Core) seem to lack overall planning policies which would lend coherence to the district as a whole.

It is the goal of this document to enrich the unique character of each district while simultaneously establishing base-wide policies to create an overall clarity and harmony. These Design Compatibility Guidelines have been formulated to:

- Bring current base policy into conformance with the Air Combat Command (ACC) Design Standards.
- Further the development of a base-wide “corporate image” through the creation of a base-wide “campus atmosphere.”
- Create an architectural style that responds to the climatic influences of the area.

In pursuit of these objectives, this manual has been established to provide coordinated design criteria throughout the base. These criteria include:

- Site Design Standards
- Architectural Standards
- Interior Design Standards



Landscape Architectural Standards

- Signage Standards
- Site Lighting Standards
- Engineering Standards





SECTION 2.0

Introduction

2.1 BASE MISSION

2.1.1 History

Nellis AFB, the “Home of the Fighter Pilot,” began as a gunnery school for the Army Air Corps on 25 January 1941. The original mission of the new school, named the Las Vegas Army Air Corps Gunner School, was the “training of aerial gunners to the degree of proficiency that will qualify them for combat duty.” Renamed the Las Vegas Army Air Field (LVAAF), the base received B-17’s in 1942. A runway extension project in 1943 made way for the arrival of B-29 bombers and, in 1945, the base became the B-29 Gunnery School. As World War II came to a close, activity on the base gradually declined until finally, on 31 January 1947, the base was inactivated.

The base was reactivated in 1948 as the Las Vegas Air Force Base. Gradually transformed into a training station for jet fighter pilots, it was renamed Nellis AFB in 1950.

Since then, Nellis AFB has provided graduate level training for U.S. Air Force (USAF) combat crews. Originally the base was under the Air Training Command. Then, in 1958, it was placed under Tactical Air Command and since 1995, as the USAF Warfare Center, under Air Combat Command (ACC).

Today Nellis AFB provides training for composite strike forces, which include every type of aircraft in the USAF inventory. In addition, training is conducted in conjunction with air and ground units of the Army, Navy, and Marines Corps as well as allied nation air units from Europe, Asia, and South America. are briefly described in the following paragraphs.

2.1.2 Base Components

The USAF Warfare Center is composed of three wings at Nellis AFB (the 57th, 98th, and the 99th) and a fourth wing (the 53rd) at Eglin AFB in Florida.

The 99th Air Base Wing provides command guidance for all support agencies located at Nellis



or associated with the USAF Warfare Center. The wing is supported by the 99th Mission Support Group, 99th Medical Group and 99th Security Forces Group.

The 57th Wing consists of the 57th Operations Group, whose major components include the 11th, 15th, and 17th Reconnaissance Squadrons, the 414th Combat Training “Red Flag” Squadron, and the 547th Intelligence Squadron. Also included is the 57th Operations, 57th Maint. Group, USAF Weapons School, Joint Air Ground Operations School, and the USAF Air Demonstration Squadron, commonly referred to as the Thunderbirds.

2.1.3 Mission Statement

The primary mission of the USAF Warfare Center is to manage advanced weapons and tactics training and is responsible for operational test, evaluation and tactics development for Air Force combat weapons system.

2.2 REGIONAL SETTING

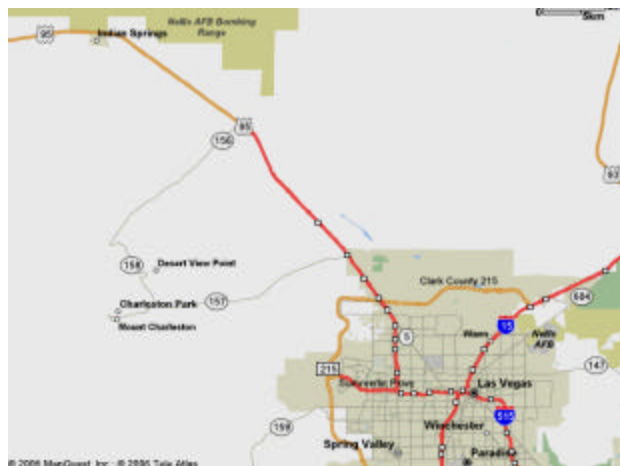
2.2.1 Geographic Setting

Nellis AFB, in southeastern Nevada, is located 8 miles north of Las Vegas, Nevada. The base is on the northeastern periphery of the Las Vegas Valley, a large topographic depression bounded by the Las Vegas Mountain Range to the north and by Mount Sunrise and Frenchman’s Mountain to the southeast. The base is easily accessible by Interstate 15 and U.S. Highways 93 and 95.

2.2.2 Climactic Setting

The climate at Nellis AFB is typical of the desert southwest. At an altitude of 1,870-feet, the climate is arid with an average humidity of 20 - 39% and a precipitation of 3.87-inches annually. Most of the rainfall occurs during January-February and July-August.

The region averages 310 days of sunshine per year. Summers are hot, with maximum temperatures commonly in the range of over 100°F. Winters, however, are mild with daytime



maximum temperatures reaching 60°F and minimum temperatures averaging about 35°F. Each summer, usually during a brief, two-week period, the infusion of warm moist tropical air causes scattered thunderstorms and flash flooding. Occasionally the flooding can be severe and strong winds are often associated with the rainstorms. In general, however, winds in excess of 50 mph are rare.

2.2.3 Geologic Setting

The natural, regional landscape character is flat, desert terrain encompassed by dramatic rocky mountains. The mountains rise to an elevation of nearly 12,000-feet, creating a scenic backdrop to the valley floor. On the base proper, the land generally slopes to the southernmost boundary. Drainage for the base as well as for the entire region flows to Lake Mead, 10 miles east of the base, via the Las Vegas Wash.

The regional geology of the Las Vegas valley is composed of coalescing alluvial fans of silty sands originating in the surrounding mountains. Hence, the valley surface geology consists of silty sands with carbonate rocks appearing in the mountain foothills.

2.2.4 Soils

Soils on the base generally consist of silty sands. Concerns regarding the existence of expansive soils have been expressed recently, due to the cracking of concrete foundation slabs in the Manch Manor Residential Neighborhood. While investigations into the problem have been inconclusive, the existence of expansive soils remains likely.

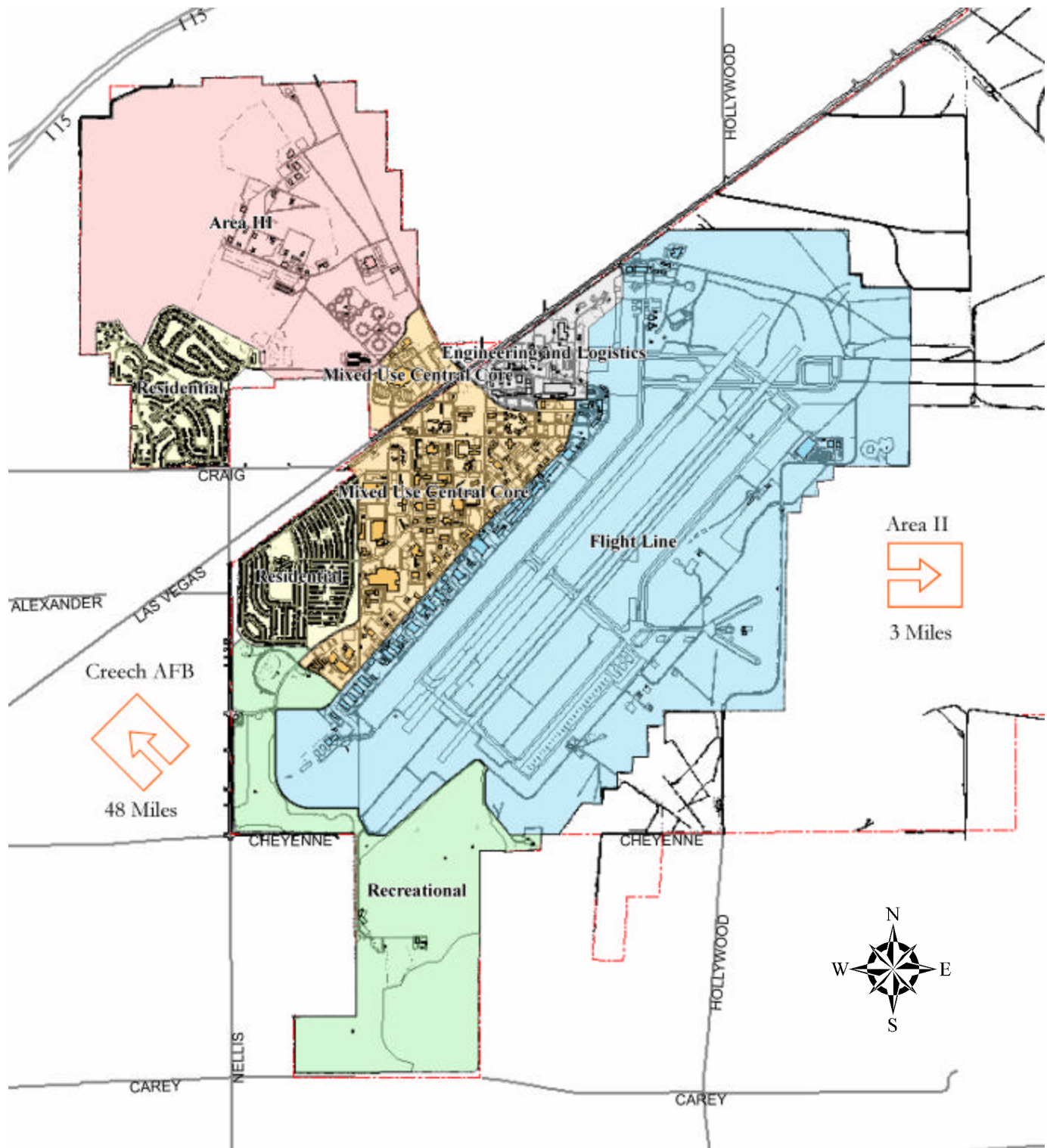




SECTION 3.0

Base Overview and District Analysis

Nellis Air Force Base Districts



Map 1: Base Districts

3.1 GENERAL OVERVIEW

These design guidelines seek to foster the creation of a “corporate image” for Nellis AFB through the development of a “campus atmosphere” on the base proper. The plan for achieving this “campus atmosphere” is the implementation of simple and clear principles of planning, architecture, and landscape architecture throughout the base.

The planning principles generally include the development of guidelines for integrating buildings and open space. The guidelines will coordinate the regulation of street hierarchy, building massing and heights, and functional zoning and sub-zoning for the creation of unified districts. The criteria will include adopting common setback requirements for the reinforcement of street edges, establishing direct relationships between buildings, entrances, and street frontage. The criteria will provide guidance regarding appropriate adjacencies at district edges. Incorporating these planning guidelines will contribute to the creation of a clearly identifiable air force base with a legible physical matrix similar to that found on college campuses, corporate office parks, and traditional American small towns.

Architecturally, the guidelines will specify a limited, but not overly restrictive, palette of exterior materials. This will assist in the creation of a holistic image for the base. Common district-wide policies towards sloped roofs and common fenestration types and patterns will further reinforce the “campus atmosphere.”

With respect to the overall landscape, the importance of street trees for the creation of a unified environment cannot be overstated. The planting of street trees for major thoroughfares can successfully integrate the different districts into a coherent whole. If linked with the various open spaces across the districts, the streets can form a base-wide system of open space development, providing a continuous network of vehicular and pedestrian pathways.

Recent work on the base has returned to adopting the characteristics of indigenous architecture of the American Southwest. This palette typically includes rugged walls of “Nellis Brown” split-face concrete masonry units with punched-out windows

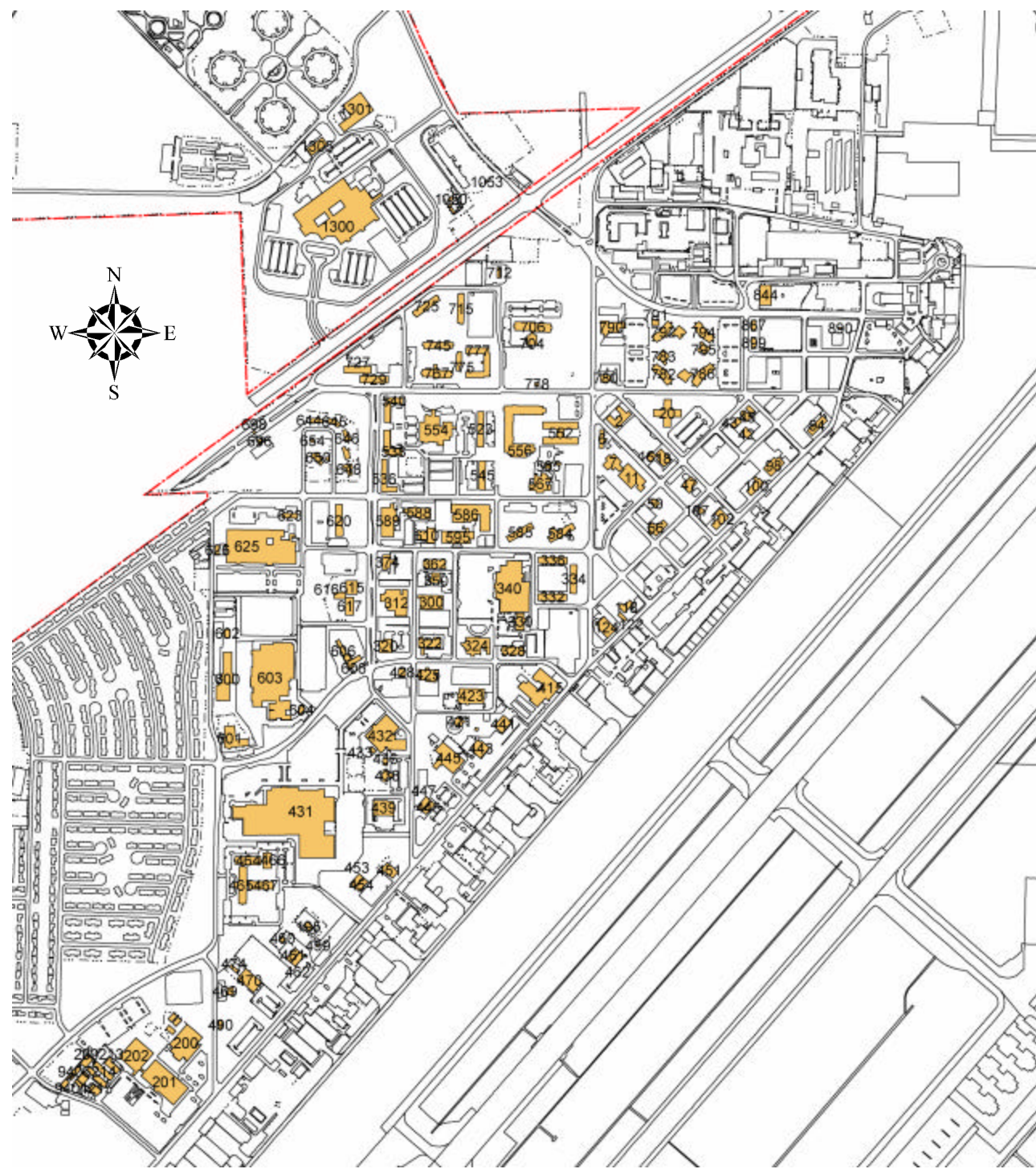
and sloped roofs of standing seam metal. This general assemblage of materials, expanded base-wide, will yield a coherent and distinct character uniquely fitted to Nellis AFB. Moreover, this architectural approach will be both environmentally and economically sound because besides being energy efficient, it is also sensitive to the historical and cultural environment of the American Southwest.

All projects at Nellis AFB must be constructed in accordance with the Nellis Design Compatibility Standards, the ACC Design Standards (Appendix 2), the International Building Code, the Americans with Disabilities Act, the Uniform Federal Accessibility Standards, and UFC 4-010-01, DOD Minimum Antiterrorism Standards for Buildings.

For security engineering guidelines reference Army Technical Manual 5-835-1, 5-835-2 and 5-835-3 or Air Force Manual 32-1071V1, 32-1071V2 and 32-1071-V3. For facility site design guidelines reference UFC 4-010-02, DOD Minimum Standoff Distances for Buildings. Reference Air Force Handbook 32-1084, Facility Requirements, for programming information.



3.2 Nellis AFB Districts



Map 2: Mixed Use Central Core

3.2 NELLIS AFB DISTRICTS

3.2.1 Mixed Use Central Core

The buildings in the Mixed Use Central Core vary greatly in almost every respect. This area of the base contains a vast array of functional building types, including restaurants, warehouse stores, dormitories, office and command buildings, a church, clubhouses, and park areas. Architecturally, the buildings consist of simple one-story structures with sloping roofs, large single-story flat-roofed warehouse type structures, multi-story pitched roof dormitories, and multi-story flat roofed office buildings. Roofing materials range from built-up roofs to standing seam metal to clay/concrete tile. Exterior wall surfaces also vary widely. The material palette includes stucco and concrete masonry units on the smaller, residential type structures, while pre-cast concrete and glass curtain walls appear on larger, office-type facilities. With few exceptions, the ratio of wall to window is appropriate for the tough desert region of the base. Most buildings have “punched out” windows of fairly modest size and scale.

Landscaping within the Mixed Use Central Core varies as much as the architectural styles and use. There are large expanses of gravel with minimal plant material throughout. More recent landscaping has a desert theme, with drought tolerant plants and earth tone gravel. Yet most of the existing landscaping is site specific, with few elements linking the central core together as a whole.

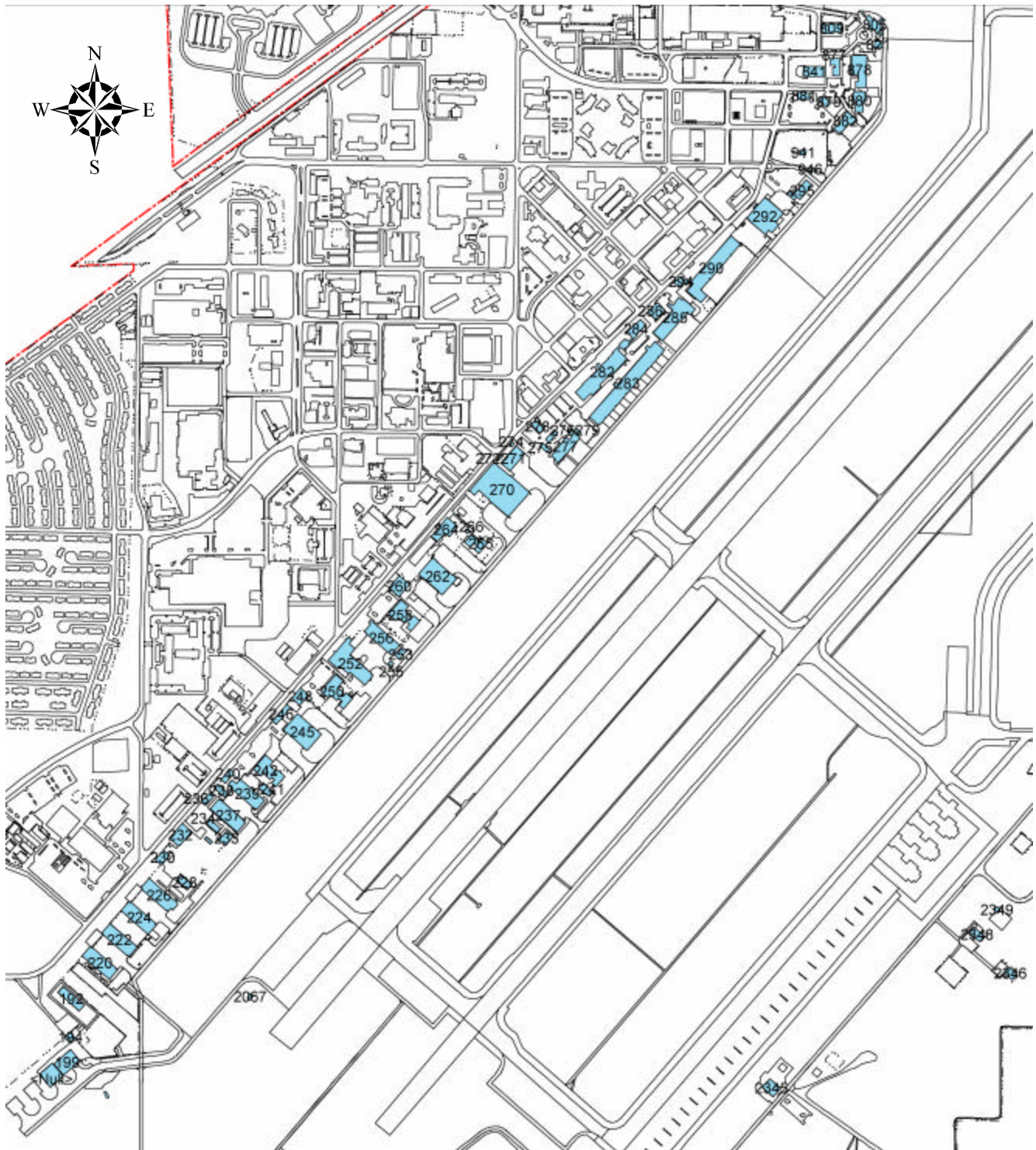
In general, the relative visual clutter of the area derives from lack of planning guidelines. There is neither clear internal organization to the central core as a whole, nor are there any functional sub-zones or organizational sub-groupings. There is no clear street hierarchy, no hierarchy of building massing, and no consistent relationship of buildings to the street.

In the future the implementation of an overall streetscape plan together with the development of a town center/market square can unify the overall district and provide a central public open space for the base. The architectural treatments should conform with the split-faced block or stucco, clay tile

or standing seam metal roofs, deep set windows, protected entries, trellis shading, and small courtyards.



3.2 Nellis AFB Districts



Map 3: Flight Line

3.2.2 Flight Line

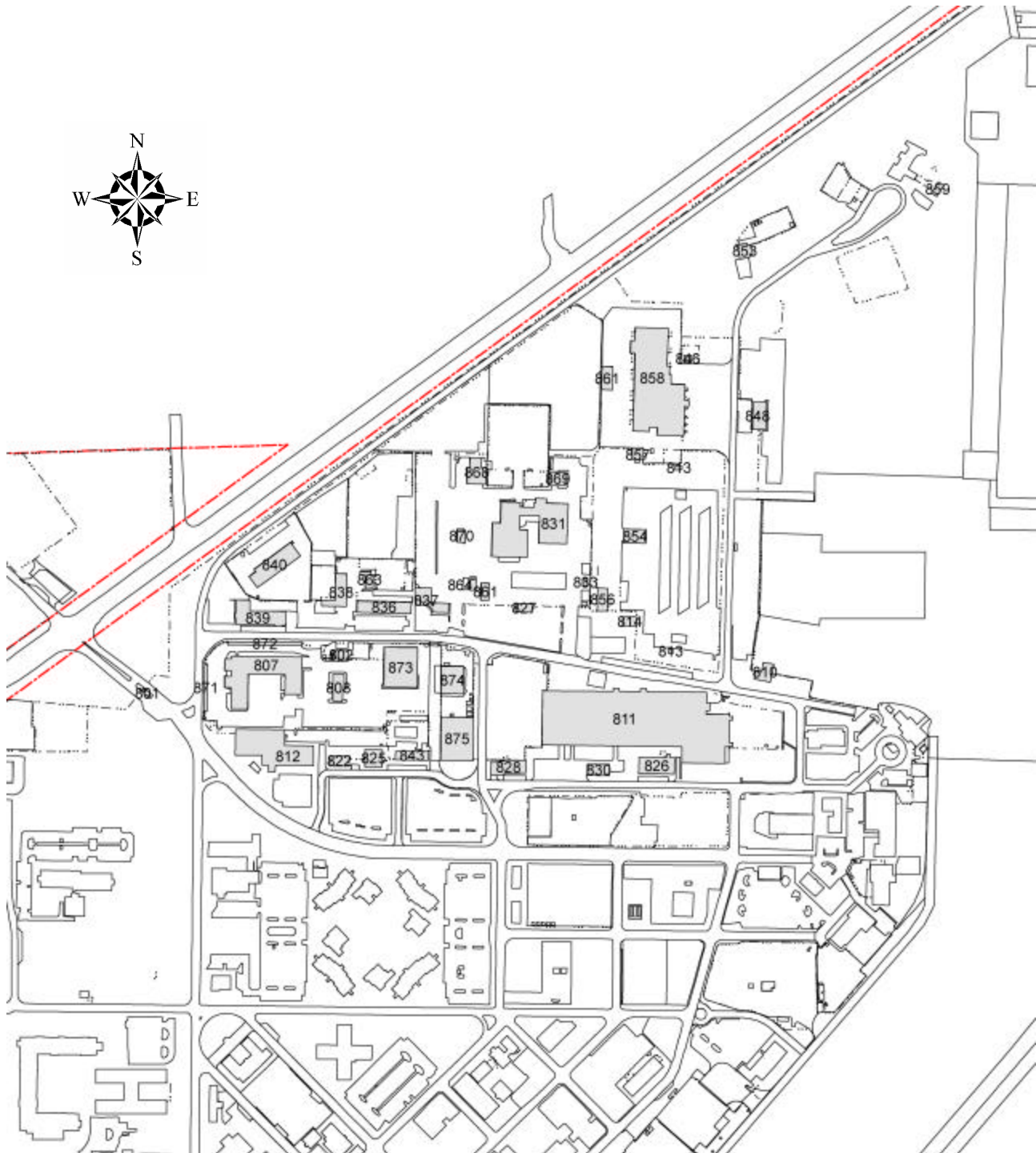
The flight line consists of a linear array of buildings along the southeastern edge of the base. Its northern boundary is Tyndall Avenue, which runs parallel to the flight line. Tyndall serves as the main street for the flight line, providing both pedestrian and vehicular access to all the buildings. These buildings consist mainly of hangar type structures fronting the aircraft parking apron. Smaller support facilities, located between the hangars and Tyndall Avenue, are used for maintenance, fire training, and supplies storage. The flight line is primarily industrial in character, the majority of buildings consisting of large metal panel structures with sloping metal roofs. These buildings form a clear and coherent visual presence for the primary mission of the base. The support facilities tend to be less homogeneous.

Minimal landscaping occurs along the rear of the flight line between the structures and Tyndall Avenue. Walls have been constructed between hangars and support buildings to provide a visual screen and spatial definition. Appropriate landscaping for the desert environment has been implemented only at the Thunderbirds' Building. The lack of adequate planting draws attention to the existing overhead power lines along Tyndall Avenue.

In general, the flight line buildings have a well - developed presence facing towards the runways, but this image is only hinted at when viewed from Tyndall Avenue. Tyndall Avenue lacks a clear system of pedestrian and vehicular entrances. The Thunderbird and F-22 facilities serve as a model for this area; it creates a sense of presence along Tyndall Avenue and of expressing the importance of the flight line. Simultaneously, these facilities provide a clear sense of entry for both pedestrians and vehicles. Extending the planning principles implicit in these facilities down the length of Tyndall Avenue will establish both a clear public presence and a coherent organizational pattern for the entire flight line along Tyndall Avenue.



3.2 Nellis AFB Districts



Map 4: Facilities Engineering

3.2.3 Facilities Engineering & Logistics Readiness

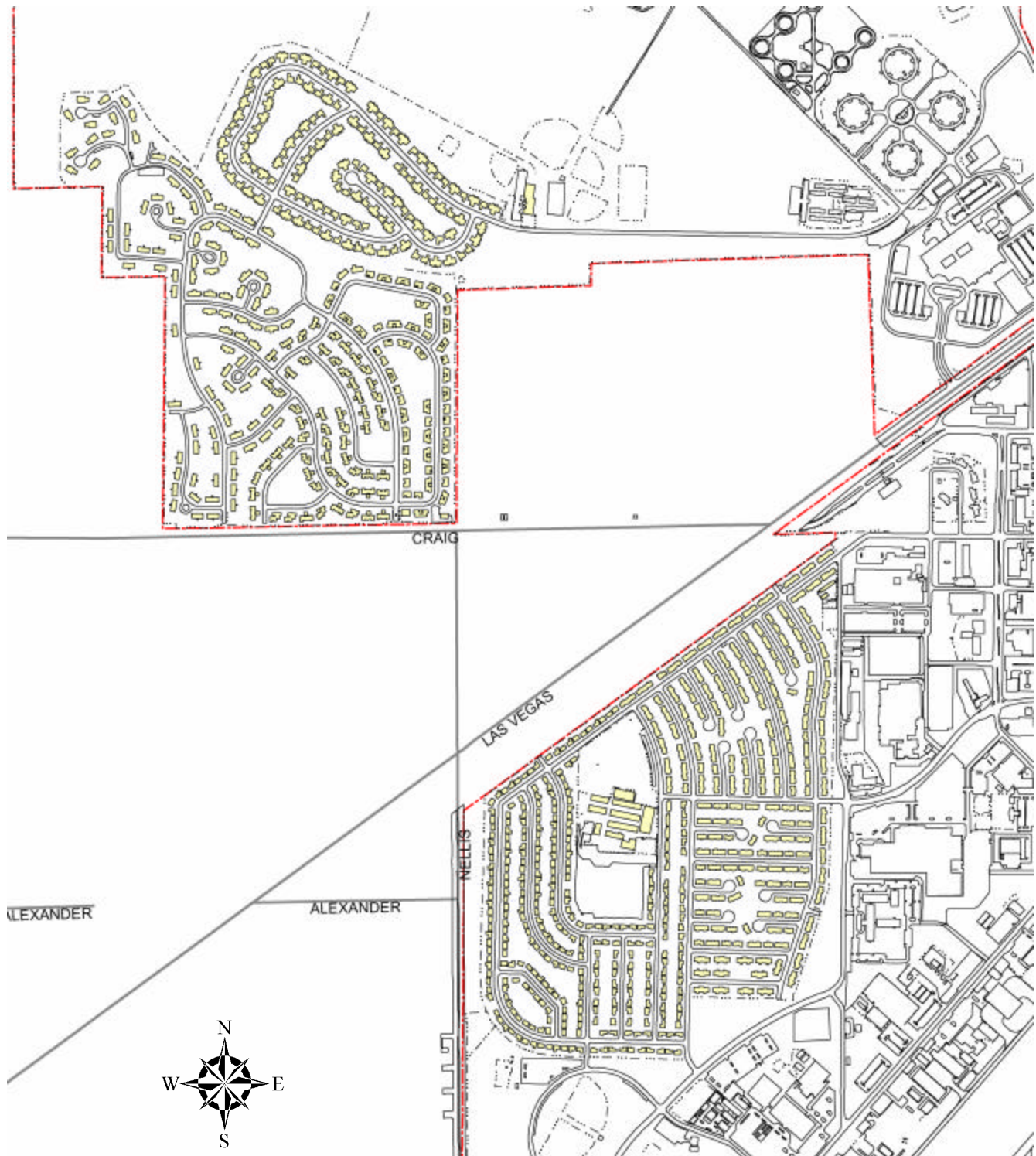
The Facilities Engineering & Logistics Readiness area of the base is a fairly compact region of one-story structures serving as support for the entire base. The buildings consist of offices and maintenance structures. They are simple and utilitarian. The primary materials include a mix of concrete masonry units and metal panels, with either very low-sloped roofs or flat roofs. Door and window openings are “punched out,” and well proportioned to both their internal function and the exterior environment.

Concrete masonry unit walls are used to screen storage areas from streets and building entrances. Spaces between the buildings are typically paved to allow for vehicular circulation and access to the loading areas. Landscaping is limited within these areas and has been primarily implemented at the front of buildings and around perimeter walls. The landscaping adjacent to the buildings and walls, installed prior to the creation of the Nellis AFB Landscape Master Plan Criteria, does not reflect the current direction of landscape architecture on the base.

As with the Mixed Use Central Core, development in the Facilities Engineering area appears haphazard. There appears to be no overall plan regarding functional zoning, building massing, or street hierarchy. Establishing a consistent relationship between building and street frontage is the most important planning policy needing implementation in the Facilities Engineering district. Adoption of this policy will reorient the extant usage patterns of buildings in this district so that buildings front onto the public street system and enclose vehicular service courts towards the interior of the block. The architectural treatments shall conform with split-faced block, standing seam metal roofs, deep set windows, protected entries, trellis shading, and small courtyards.



3.2 Nellis AFB Districts



Map 5: Residential Neighborhoods

3.2.4 Residential Neighborhoods

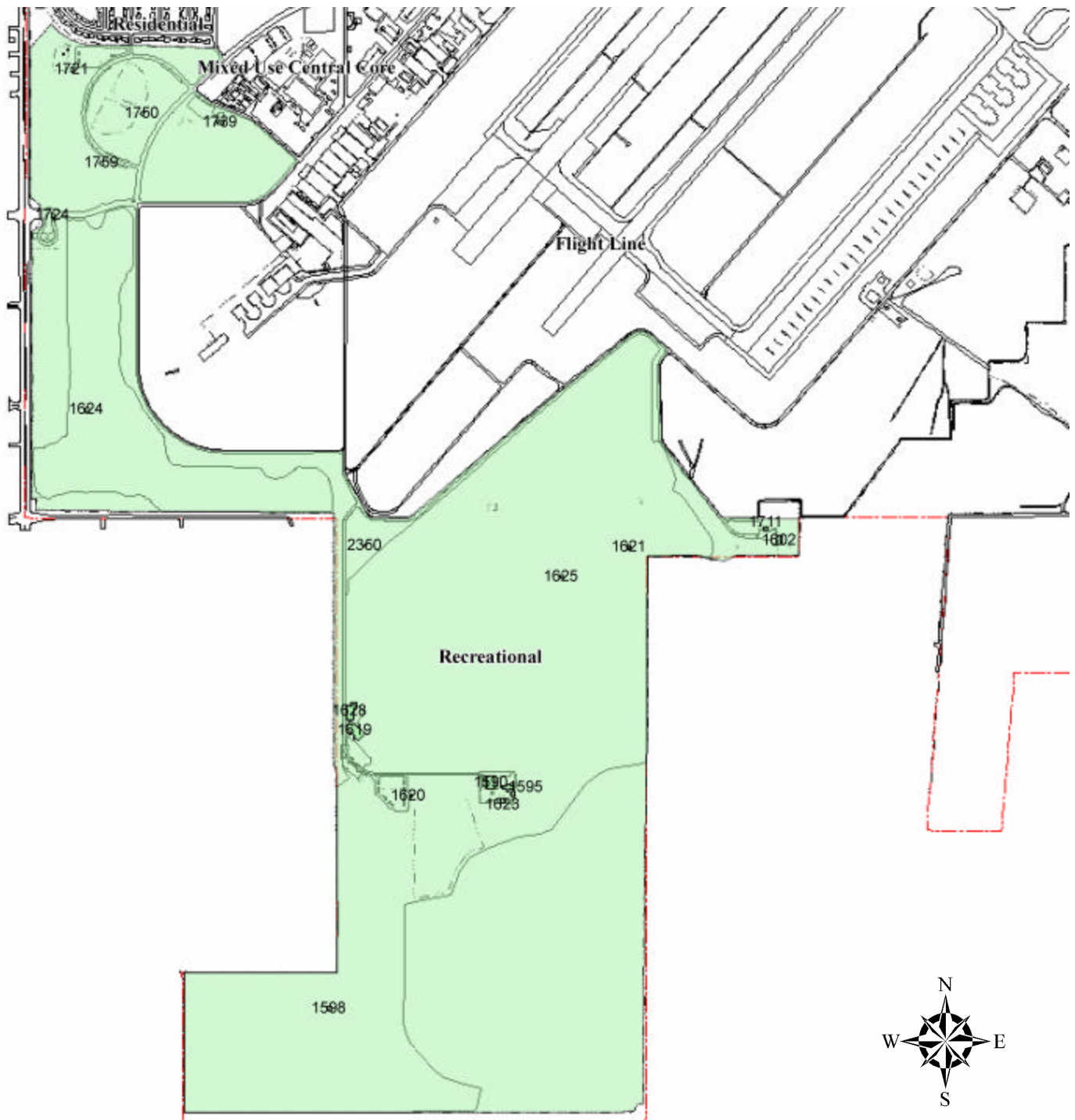
The residential neighborhoods at Nellis AFB have begun to emerge as a clear and coherent arrangement of dwelling units. The buildings are almost uniformly single-story structures with sloping roofs, usually of clay tile. The homes share a commonly scaled pattern of fenestration. They all front the street appropriately and typically focus on central neighborhood features. In the case of Manch Manor, the central feature is a recreational park, while in the case of Nellis Terrace, it is the Lomie Gray Heard Elementary School. Current renovations in the residential neighborhoods have successfully integrated the older structures with newer ones to provide a uniform appearance.

Landscaping in the residential neighborhoods exhibits characteristics of milder, less arid parts of the country and is somewhat inappropriate for desert climate. All of the yards consist of turf with minimal use of other plant material. Large street trees exist which lend shade, but the trees are not typical of the desert environment, increasing water usage and maintenance requirements. The trees do provide an edge to the streets, which are fairly wide. The areas of Nellis Terrace which have been redeveloped have a more environmentally friendly landscaping in the front yards and turf is limited to small areas in the rear yards. These should serve as a model for the future.

Architectural character constitutes a successful program for integrating new buildings with existing ones. They also illustrate successful planning for the gradual expansion of neighborhoods over time. The development of separate residential neighborhoods, in lieu of a continuous matrix of undifferentiated housing units, establishes a scale and individuality appropriate to residential usage. Care should be taken, however to ensure that sufficient common facilities are provided, as these individual neighborhoods continue to proliferate. These common “town center” facilities should both reinforce the individual character of each neighborhood and integrate the various neighborhoods together.



3.2 Nellis AFB Districts



Map 6: Recreational Areas

3.2.5 Recreational Areas

The recreational areas at Nellis AFB are primarily oriented around large, grassy areas into which are inserted a variety of features. Ball fields, running tracks, picnic shelters, and barbecue pits populate an otherwise open expanse of lawn. The open-air shelters are simple pitched roof structures supported on columns. The roofs are either clay tile or standing seam metal, and the columns are either wood or split face concrete block.

The open recreational area contains playing fields for softball, baseball, soccer, and football. While this accommodates basic recreational needs, further development is necessary to enhance the general character and expand the functional utility of the district. The area currently has an abundance of turf, despite the excessive water and maintenance demands needed for turf. The area also has a minimum of supportive landscaping along the street edge, the jogging trail, and the picnic areas. Such landscaping, if implemented correctly, need not increase water usage or maintenance. In general, reorienting these priorities, reducing unnecessary turf while adding needed shade trees, will assist in maximizing the potential of the recreation district.

Aside from the adjacency of the recreational areas to residential neighborhoods, no base-wide system of open space has been developed. The linkage of the individual park elements together in a coordinated fashion should be planned for the future. A unique feature of the recreational spaces, which may begin to provide this linkage, is the incorporation of aircraft shells elevated on concrete bases. These sculptural pieces thematically connect the recreational areas with the rest of the base and provide unique elements for the enjoyment of both children and adults.





3.2.6 Area II

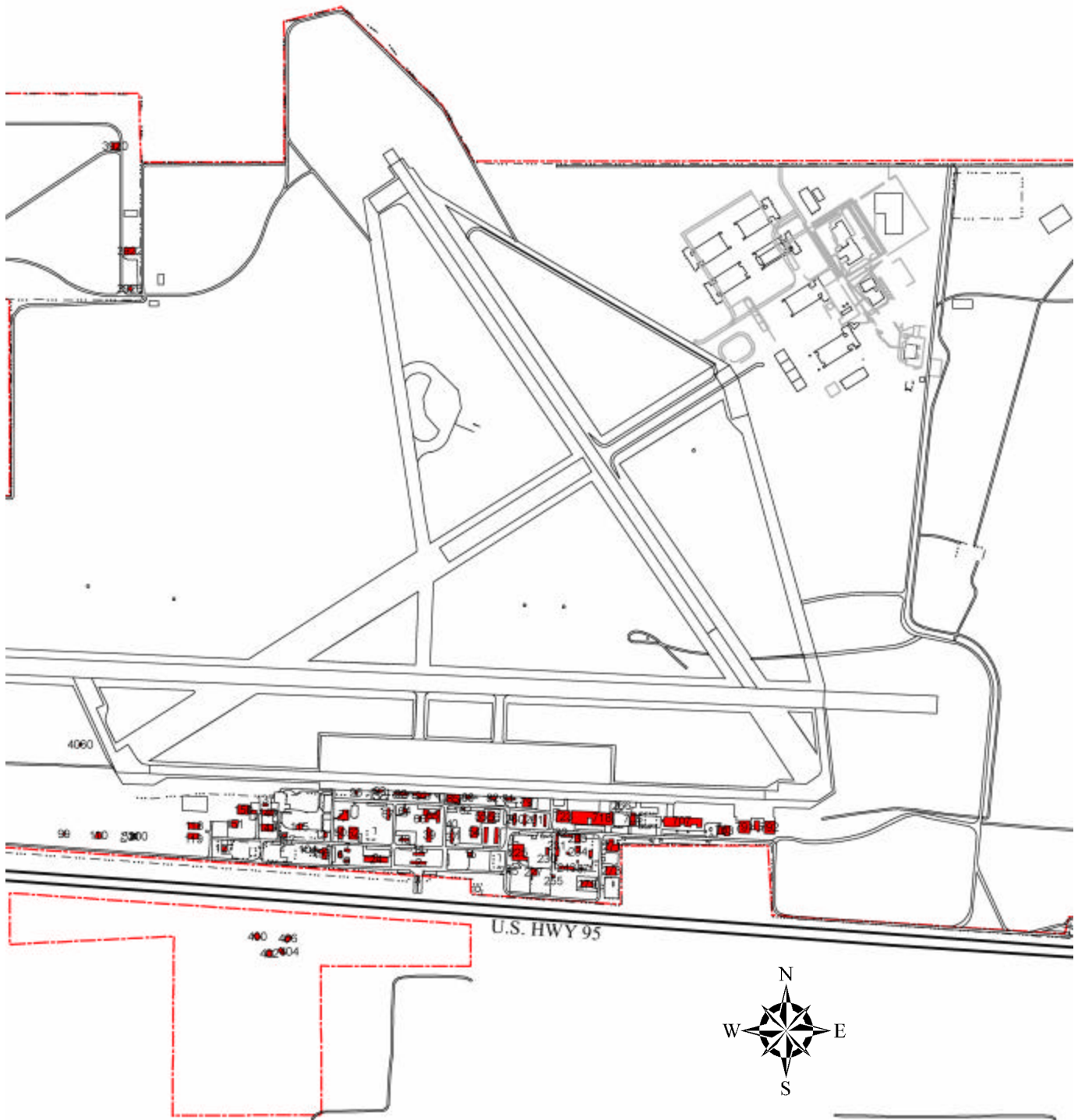
The buildings in the Area II District, although they vary greatly in many respects, constitute a fairly coherent and well-orchestrated campus-like complex. This area consists primarily of a one-story office building for the Red Horse Squadron, numerous large one-story storage buildings, and a campus of multi-story buildings focusing on the cafeteria.

Architecturally, the buildings in the area have exterior walls of either concrete masonry units or stucco, with roofs of either standing seam metal or low sloped asphaltic built-up roofing. Doors and windows are a “punched out” type of fenestration, appropriate for both the interior functions of the buildings and harsh external environment in which they are located.

Landscaping within the area is appropriate for the desert climate, but too sparsely applied to function effectively. There are large expanses of both gravel and turf with minimum plant material throughout. While more recent landscaping has a desert theme with drought tolerant plants, extending this policy is critical to enhancing the area.



3.2 Nellis AFB Districts



Map 8: Creech AFB, Nevada

3.2.7 Creech AFB

Creech AFB is an independent airfield under Nellis AFB's command and is located 48 miles northwest of Nellis AFB at Indian Springs, Nevada. Creech AFB consists of a relatively modest flight line supported by offices and maintenance facilities. The buildings are primarily one-story structures with low-sloping roofs. The roofs are typically asphalt shingles or standing seam metal. Exterior wall surfaces include metal panels, stucco on wood frame, concrete masonry units, and horizontal and vertical siding. Windows are small and "punched out." A vacated residential neighborhood sits across the State Highway. The buildings are generally sandstone in color, with brown colored accent trim. The outstanding feature of the base is the control tower and new facilities supporting the Predator UAV mission.

Turf is the primary landscape material at Creech AFB. Most areas which are not planted with turf are neglected all together. Landscape architecture at the airfield has not been addressed as a whole. It appears to be done on a case-by-case basis with little effort being made to unify the landscape or to design within the limitations of a desert environment.

In general, the overall organization of Creech AFB is good. The area has clearly delineated zones of Flight Line, Facilities Engineering, and Residential Neighborhood. The clarity of this structure should be maintained in future development. Individual developments should take a look at creating "people spaces" such as enclosed courtyards, shaded walkways, etc. The architectural treatments shall conform with brown split-faced block or stucco, concrete tile or sandstone colored standing seam metal roofs, deep set windows, protected entries, trellis shading, and small courtyards.

Note: The variety of building types at Creech AFB is directly comparable to the variety and type of buildings at Nellis AFB. The Design Guidelines which are applicable to Nellis AFB are applicable to the corresponding areas of Creech AFB.





SECTION 4.0

Site Design Standards

4.1 USE GROUPS/ADJACENCIES

Due to the variety, mix and growth of building types on the base, projects should be reviewed on an individual basis. In general, new buildings of similar type and usage should be located in close proximity to existing buildings of similar types and usage. This will continue to reinforce the unique character of each of the different districts. Simultaneously, this will reinforce the developing sub areas in the Mixed Use Central Core. Heights of buildings may vary as functionally required, but height should not vary more than one story from adjacent buildings.

In the Mixed Use Central Core, the “downtown” of Nellis AFB is bounded by Washington Avenue to the west, Fitzgerald Boulevard to the north, Rickenbacker Road to the south, and Ellsworth Avenue to the east. This subzone, or “district within the district,” contains facilities of central social importance to the entire base, e.g. the bank, supermarket, church, etc. Within this “downtown” area, the current parking area encompassed by the NCO Club, and theater has the potential for development as the town center or market square. Future retail and civic/institutional buildings should be sited in this area to reinforce the emerging “town center/market square” atmosphere.

Existing bachelor enlisted quarters are interspersed throughout the Mixed Use Central Core, typically clustered as a pair or quadrangle of units. Future housing should seek to reinforce and expand the existing clusters rather than create additional zones of development.

Future ancillary facilities which are directly supportive of the base flying mission along the Flight Line should be situated along Tyndall Avenue. This will serve to link new facilities both to the existing squadron buildings and to the Flight Line.

Regarding Residential Neighborhoods, continue to develop single family residential areas of limited extent around neighborhood oriented facilities. Nellis Terrace, clustered around Lomie Heard



Elementary School, serves as a good model for this type of development.

In Recreational Areas, congregate recreational structures (bandstands, gazebos, picnic shelters) together to generate coordinated areas of activity within the larger overall area.

4.2 BULK: MASSING AND HEIGHTS

Projects should be reviewed on an individual basis. In general, throughout the base, buildings should be restricted to two-stories in height, excepting unaccompanied housing facilities, which are permitted to be three-stories. Hangar facilities along the Flight Line should be sized according to functional requirements.

In the Mixed Use Central Core, as pressure mounts for additional development, concentrate taller buildings in the “downtown” area, described previously.

Along the Flight Line, at the southern end of Tyndall Avenue, locate future flying mission support facilities. These lower height buildings will simultaneously articulate entranceways, screen parking areas, and enhance the frontal presence of the Flight Line.

In the Facilities Engineering & Logistics Readiness area, attempt to maintain the one-story industrial character of this area.

In the Residential Neighborhoods, future development should incorporate two-story residential units as a means of economizing on land use, foundation and roofing costs, and HVAC usage.

In all Districts, where massive, large floor plan buildings are sited adjacent to smaller facilities; the larger building should be “broken down” visually to integrate with the adjacent structures. Building entrances, canopies, loggias, and the articulation of exterior wall components can all serve to integrate larger buildings into the streetscape.



4.3 OPEN SPACE: STREETS, STREET WALKS, YARDS, SETBACKS AND SIDEWALKS

Given the predominantly built-up character of the base, providing regularity of the streetscape elements offers tremendous opportunity for creating a more cohesive environment. This will include controlling the relationship of sidewalks to curb, coordinating street plantings in relation to the curb, and regulating the types of street tree plantings. The adoption of these guidelines will reinforce the existing street hierarchy of the base, creating a more “legible,” user-friendly environment.

4.3.1 Streets

To enhance and unify the overall character of the base, trees should be provided along the streets and at intersections.

Planting should be provided along presently developed streets immediately. This will provide for a better appearance base-wide. As development occurs, consistent planting along streets must be provided.

Within the Mixed Use Central Core, only Washington Boulevard has streetscape planting. The Boulevard is lined with palm trees, which create an identifiable feature. The concept of streets with landscaping lining the edges should be implemented throughout this district. The landscaping along the street edge does not need to be regular. Irregular plant spacing will provide a desirable effect and blend better with the natural environment. The streets (other than Washington Boulevard) which require street trees to link this district together are Fitzgerald Boulevard, Duffer Drive, Rickenbacker Road, Ellsworth Avenue, and Griffis Road from Tyndall Avenue to Rickenbacker Road.

Along the Flight Line, Tyndall Avenue is the main circulation route and should be enhanced to emphasize its importance to the base. As you enter the base on Tyndall Avenue, landscaping should be provided to indicate arrival. Once inside the gate, the landscaping should be less



Site Design Standards SECTION 4.0

formal, with meandering curvilinear sidewalks beside the road. This design can be tied directly to the neighboring recreational area. As one progresses up Tyndall Avenue directly adjacent to the Flight Line (i.e. as Tyndall turns 45° to the north), a more regular approach should be taken. Here, sidewalks should revert from a continuous meander to the regular straight type. In general, sidewalk types should be keyed to uses. Undeveloped land areas and recreational zones at the periphery of the base should receive curvilinear walks. All other areas should receive straight walks.

Areas that contain drainage swales should be naturalized. These drainage areas should be lined with river rock and meander instead of being linear. Native desert plant material which thrives in this situation should be used. The western edge of Tyndall Avenue shall be landscaped with street trees to define the edge of the Flight Line and the Mixed Use Central Core.

In the Facilities Engineering & Logistics Readiness area, landscaping should be concentrated at the fronts of the buildings, especially those which front on Beale Avenue, the main road through this district. The rear and sides of the buildings in this district are primarily for loading and storage. These areas should be screened with a combination of plant materials and walls.

In the Residential Neighborhoods, planting design should provide tree-lined streets, encourage pedestrian activity, and create a neighborhood environment. Landscaping of front yards should provide a diversity of plant material which will help create individuality from house to house. Turf should be limited to open play areas and the rear yards of housing.

Landscaping should be used to link the different aspects of the Recreational Areas. Pathways and sidewalks should provide a continuous connection to the different activities. Berming should be used along the perimeter of this district to provide a buffer between streets and adjoining uses. Turf

should be limited to areas such as baseball/softball fields, soccer fields, and open play areas.



4.3.2 Street Walls, Yards and Setbacks

In all districts, to promote the development of street walls, buildings should front directly onto a street and not be set diagonally to the street frontage.

Street tree plantings should reinforce the street edge. While more critically necessary in built-up areas, street trees should also be planted in undeveloped areas to visibly reinforce the roadway, and provide shade for bicyclists and pedestrians.

On corner lots, both streets are to be considered front yards, and both sides abutting other lots are to be considered side yards.

4.3.3 Sidewalks

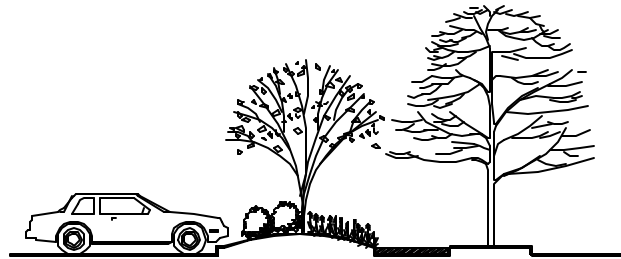
Walkways should be located and aligned to maximize views of surrounding natural features and open spaces. Curved walkways shall be designed as sweeping curves that create visually appealing landscape forms. Abrupt or irregular curves and jogs should be avoided. Curved walkways should not be used in areas too narrow to allow a sweeping curve. Along primary streets, walkways which are parallel to the curb should be held a minimum of 5-feet from the back of curb. This allows for street trees to be planted between the walk and the curb. Along secondary streets, the walks may extend to the back of the curb, as currently exists in areas of the base. For each street, once the location of the walks in relation to the curb has been established, it should be maintained for the entire street.

All walkways should be handicapped accessible. Requirements of the Americans with Disabilities Act and Uniform Federal Accessibility Standards must be met when designing walkways, ramps, and other pedestrian access facilities. Where site or development conditions make full handicap access unfeasible, an alternative handicapped route shall be provided. Handicapped accessible walkways shall be designed to the following standards:



1. It is preferred that walkways not exceed continuous grades over 3%. Walkways with sustained grades in excess of 5% are considered ramps and shall have level areas a minimum of 5-feet in length every 30-feet.
2. Where possible, walkways should have a continuous common surface, not interrupted by steps or abrupt changes in level exceeding ½-inch. The walk surface shall be relatively smooth and have a non-slip surface such as a medium broom finish. These standards apply wherever walkways cross other walkways, driveways or parking lots.
3. Surface cross slopes shall not exceed ¼-inch per foot (2%).

placed around the edges of parking lots to provide the required quantity for peripheral parking bays only. Trees shall be planted in landscaped islands or strips within parking lots. In all cases, tree planting shall be evenly distributed around and throughout parking lots to provide the required planting for both peripheral and internal parking bays. Only one tree may be provided for each 9-foot by 18-foot island in a parking lot. Minimum spacing between trees in parking lot islands shall be 25-feet.



4.3.4 Parking

Parking should be located towards the interior of the block, in the rear yard of each lot, unless otherwise dictated by functional necessity. Where dictated by functional necessity, parking may be located in side yards adjacent to the building.

It is preferred that parking spaces be 90° to parking lot aisles. Aisles should be 26-feet wide and parking spaces 9-feet wide by 18-feet deep.

Parking in Residential Neighborhoods should be directly off the street, following current practice. Garages or carports should be set back a minimum of 5-feet from the front plane of the housing unit, unless otherwise dictated by functional necessity.

In Recreational Areas, parking should be located towards the periphery of the recreational area. Multiple lots accommodating fewer vehicles are preferred to a single, large parking lot.

One shade tree shall be provided for every 12 parking spaces with a minimum ground area of 8-feet by 17-feet within the parking field and in adjoining curbed planting areas. Trees may be



15% of the net areas of internal parking bays shall be developed as islands. Islands may be landscaped with one or a combination of shrubs, shade and flowering trees, and groundcovers.

All shade trees in parking lots shall have a minimum branching height of 6-feet to 8-feet above finished grade.

Plant material used in combination with berming shall be used to screen parking lots from streets. Where parking lots are visible from any street, the minimum height of the screening plants at installation shall be 30-inches planted 3-feet on center.

All site entry drives shall be well landscaped with a combination of evergreen shrubs, flowering shrubs, deciduous shade trees, flowering trees, and flower beds.

Refer to Landscape Standards for additional recommendations.





SECTION 5.0

Architectural Standards

5.1 EXTERIOR WALLS

5.1.1. General Recommendations

Exterior walls should be built of integrally colored split-face or ground-face concrete masonry units. All concrete masonry units and mortar should be manufactured with additives to discourage efflorescence. Buildings should be limited to one primary type of masonry, with an option to include an accent feature of a complementary type and/or color. Thicker wall sections, which allow for thermal lag, are encouraged. Exterior walls of buildings with HVAC systems shall be insulated to at least R-19.

Patterning of concrete masonry unit walls, such as the insertion of half-height courses, is encouraged to provide a sense of scale, pattern, and texture to the buildings. Patterning of concrete masonry units can also be used successfully to articulate building entrances.

When required in large-scale structures (hangars and industrial buildings) metal clad buildings may be used along the Flight Line and in the Facilities Engineering & Logistics Readiness area. However, such buildings should be provided with a base of integrally colored split-face or ground-face concrete masonry units. The base should match the material, height, and color of adjacent administrative or support structures. When used atop this masonry base or water table, the metal wall panels should be of pre-finished aluminum or galvanized steel. Metal roof panels should match the metal wall panels of the building. To be acceptable, metal wall panel buildings must be provided with a 20-year guarantee against fading. Use of metal wall panel buildings requires the review and approval of the Base Architect and ACC.

Exterior walls in the Residential Neighborhoods should be finished with an acrylic stucco application. Buildings should be limited to one primary type of stucco, preferably “sand” finish. As an option, exterior walls may include an accent feature (tile band, stucco string course, etc.) of a complementary type and color. All stucco walls

should be painted. Integrally colored stucco surfaces must be sealed.

In all areas, exterior walls and/or columns of shade structures (picnic shelter, pavilions, barbecue enclosures etc.) should be built of integrally colored split face or ground-face concrete masonry units.

In Recreational Areas, congregate recreational structures (bandstands, gazebos, picnic shelters) together to generate coordinated areas of activity within the larger overall area.



5.1.1. Approved Material and Treatments

Note: Proprietary names for colors, textures and patterns are for the purpose of selection only. Other manufacturers' products may be acceptable, provided they closely approximate colors, textures and patterns indicated and conform to all other specification requirements.

Split Face/Ground Face Concrete Masonry Units

Manufacturer: Rinker

Color: "Sandstone"

Color: "Brown"

Color: "Dark Brown"

Metal Wall Panels

Color: "Frazee Paint

#213 "Travatan"

#212 "Spanish Brown"

Painted Surfaces

Manufacturer: Frazee Paint

Color: #213, "Travatan" w/ #212,
"Spanish Brown" trim

Stucco (Paint)

Manufacturer: Frazee Paint

Color: #213, "Travatan" w/ #212,
"Spanish Brown" trim

Housing

Color: #381, "Mesa Tan" w/ #8304M,
"Washed Suede" trim

Color: #182, "Arizona White" w/ #213,
"Travatan" trim

Color: #390, "Western Beige" w/ #212,
"Spanish Brown" trim



5.2 ROOFS

5.2.1 General Recommendations

Roofs should have a minimum of 3:12 pitch and be hipped or gabled at the ends. Roofs should be of pre-finished standing seam metal. For community activity facilities, use clay or concrete tiles. For single family detached residential buildings, clay or concrete tiles are acceptable. Concrete tiles are preferable to clay tiles, and shall be provided with tile bird stops at the eaves. Concrete tile shall be integrally colored.

Use of a low sloped roof only acceptable where dictated by building surroundings and/or scale. Low slope roof requires prior ACC approval. If approved, low sloped roofs should have an EPDM membrane type roof system.

Roof overhangs are encouraged. Fascias should be of formed prefinished aluminum. Soffits should be of medium density overlay (“MDO”) plywood. Roofs of buildings with HVAC systems shall be insulated to at least R-30. Provide ventilation (soffit and ridge, continuous strip at soffit, preferred) for all roof systems.

Roof penetrations (vent piping, flues, exhaust fans, etc.) should be regarded as trim items and should be painted to match the roof. Roof penetrations should be located to the rear of the buildings, away from the street frontage, whenever possible.

Rooftop equipment is not permitted on any roof. Gutters and downspouts are not required or encouraged on buildings with pitched roofs. Interior roof drains are also discouraged. Scuppers, where approved for low sloped or flat roofs, shall be of clay tile or concrete.

5.2.2 Approved Material and Treatments

Note: Proprietary names for colors, textures and patterns are for the purpose of selection only. Other manufacturers’ products may be acceptable, provided they closely approximate colors, textures and patterns indicated and conform to all other specification requirements.



Standing Seam Metal Roofing

Color: Frazee Paint

#213“Travatan”

Painted Surfaces

Manufacturer: Frazee

Color #213, “Travatan”

Color #212, “Spanish Brown”

Clay Roofing Tiles

Manufacturer: Deleo Clay Tile

Color: “Rose Stone Blend”



Concrete Roofing Tiles

Manufacturer: Lifetile

Color: # 820 California Mission Blend



5.3 DOORS AND WINDOWS

5.3.1 General Recommendations

Main entry doors should be of a glazed storefront type in thermally broken anodized aluminum frames. Glazing to be tempered, low-E insulated dual pane with 1/2-inch argon gas pocket. Secondary entrances, exit doors, and frames should be factory primed insulated hollow metal (R-4 minimum).

In single family homes, exterior entry doors should be of pre-finished insulated metal (R-4 minimum, color to be white). Factory primed, field painted doors are acceptable, but not preferred. Vehicular service doors should be of pre-finished aluminum.

Generally limit the amount of glazing on a building to 15% of the exterior wall surface area. In general, avoid large, unprotected expanses of glass, especially facing in the southwesterly direction. Avoid skylights. Clerestory windows, where functionally justified and carefully placed to avoid exposure to western sunlight, are acceptable.



Punched-out windows should be utilized throughout the district. Ganged units of a limited extent are acceptable. Windows and doors shall meet requirements stated in UFC 4-010-01.

Glazed units should be set a minimum of 2-inches back from the face of the exterior wall surface. (with 1/2-inch argon gas pocket) in thermally broken anodized aluminum frames. Triple glazing should be installed on walls where high noise levels are evident (refer to the Air Installation Compatible Use Zone Noise Contours). All glazing should be tinted. Color shading film is not permitted.

In single family homes, windows should have double glazing (with 1/2-inch argon gas pocket) in thermally broken aluminum frames with factory applied white finish aluminum frames. Operable single hung windows are encouraged, though sliding units are acceptable. Fixed units are also acceptable, where functionally justified.

5.3.2 Approved Material and Treatments

Note: Proprietary names for colors, textures and patterns are for the purpose of selection only. Other manufacturers' products may be acceptable, provided they closely approximate color, textures and patterns indicated and conform to all other specification requirements.

Hangar Doors

Color: #212, "Spanish Brown"

Exterior Painted Steel Doors/Windows/Trim

Manufacturer: Frazee Paint

Color: #212, "Spanish Brown" or

Color: Medium Bronze

Aluminum Window Units

Colors:

Frame- Medium Bronze Anodized

Glazing - Bronze Tinted, Low-E



5.4 HARDWARE

5.4.1 General Recommendations

Door hardware should be selected and sized on a case-by-case basis for its specific function. In order to unify the quality and appearance of hardware base-wide, the following recommendations are a guide to the finish and quality level expected of hardware that may not be specifically listed. All door hardware must comply with the requirements of ADA and UFAS.

5.4.2 Approved Materials and Treatments

Note: Proprietary names for colors, textures and patterns are for the purpose of selection only. Other manufacturers' products may be acceptable, provided they closely approximate colors, textures, and patterns indicated and conform to all other specification requirements. Builders Hardware Manufacturers Association (BHMA) is listed as a reference for standard finishes.

- *Door Hinges:* Exterior door hinges shall be heavy weight ball bearing. Interior door hinges shall be ball bearing or plain bearing. All hinges shall be Satin Medium Bronze.
- *Door Closers:* Door closers shall be Grade 1, surface mounted, regular or parallel arm mount. Finish shall be BMHA689, Sprayed medium bronze.
- *Exit Devices:* Single doors shall have Type 1, rim exit device. Double doors shall have Type 2 vertical rod device. Finish of all exit devices shall be Satin Medium Bronze.
- *Locksets:* Exterior and interior locksets shall be BMHA series 4000m Grade 1, lever trim, removable core function as required (see BMHA ANSI function F75-F93). Lever handles shall be provided at all locations. Finish of levers and all miscellaneous visible parts shall be Satin Medium Bronze. Provide "Best" or locks compatible with "Best" for all work

except residential buildings. The cylinder and cores must be interchangeable and have six or seven pin tumblers and be fully compatible with products from Best Lock Co. Residential projects should use "Weiser" locks for doors in the housing areas.

- *Miscellaneous Hardware:* Stops, kick plates, etc. shall be Satin Medium Bronze.
- *Thresholds:* Shall be medium bronze anodized extruded aluminum. Exposed rubber stops on holders, stops and bumpers shall be gray.

5.5 OUTBUILDINGS/GARDEN WALLS/FENCES

5.5.1 General Recommendations

Out buildings, garden walls, and fences are required for multiple purposes throughout the districts of the base. These include storage sheds, security barriers, utility and dumpster enclosures, loading dock screens, retaining walls, and ancillary architectural and landscape features.

For all districts, grade mounted mechanical equipment such as cooling towers and air handling equipment shall be screened with a garden wall. The height of the wall shall be 1-foot higher than the equipment. All loading docks and dumpsters shall be screened with an 8-foot high screen wall.

When screen walls are constructed for dumpsters, the open side shall be aligned so the truck picking up the dumpster will have access and can easily place the container within the enclosure.

Dumpsters shall not open towards a street or so that people can view into the opening from main building entrances. Dumpsters shall not be accessed from a street.

Garden walls should also be used to enhance building and neighborhood entrances and street intersections. Retaining walls, where required to accommodate changes in elevation, shall not exceed 4-feet in height. Grade changes which require retaining walls exceeding 4-feet must be terraced with a minimum 3-foot clear separation between each wall.

Materials for outbuildings, garden walls and fences should visually match either the adjacent building exterior or a material integral to the landscape. Patterning of the split face concrete block is encouraged to provide a sense of scale, pattern and texture to the wall surfaces.

Decorative top courses can be used to provide accents to walls which are highly visible. Horizontal breaks, jogs, and variations in wall heights are encouraged to minimize the monotonous corridor effect of long continuous walls.

Along the Flight Line, walls have been, and can continue to be, utilized to restrict access and simultaneously screen the parking areas along Tyndall Avenue.

In the Facility Engineering & Logistics Readiness District, walls can successfully contribute to screening the existing storage and loading areas. In the Residential Neighborhoods, walls have been utilized to demarcate each residential neighborhood into its own individual precinct. This practice should be extended to any future residential development.



5.5.2 Shade Structures

Shade structures used for break areas or picnic areas should match the architectural style of adjacent facilities. Generally, columns should be integrally colored split-face or ground-face concrete masonry units or steel columns enclosed by CMU. Roof structure should be steel framing with standing seam metal roofing or concrete tile roof. Shade structures at child development centers can have steel tube structure with tan fabric covering. Utilitarian shade structures used to shade aircraft and vehicles can have a steel structure with tan fabric covering.



SECTION 6.0

Interior Design Standards

6.1 GENERAL RECOMMENDATIONS

ACC Architectural and Interior Design Standards differentiate whether a finish will be permanent or non-permanent. The differentiation is necessary due to the color palette changes each year. Generally, permanent finishes last longer and consequently need to be a color that will not become dated after a few years. Non-permanent finishes do not last as long and can be updated to the new colors as they change.

6.2 APPROVED MATERIAL AND TREATMENT

Note: Proprietary names for colors, textures and patterns are for the purpose of selections only. Other manufacturers' products may be acceptable, provided they closely approximate colors, textures and patterns indicated and conform to all other specification requirements.

6.3 PERMANENT FINISHES

ACC Design Standards require that all permanent finishes be in either brown-tone or gray-tone neutrals. These neutral shades can be from very light (such as off-white relating to the particular color tone) to a mid-range neutral of this same shade.

Permanent finishes are generally the hard surface structural interior design (SID) finishes that will last 15 to 20 years and whose removal and re-installation is a major disruption to the facility. Such items as vinyl composition tile (VCT), ceramic, and other hard surface tiles, plastic laminates, toilet partitions, lockers, window blinds, all modular or systems furniture panels, work surfaces, flipper doors, etc., are considered permanent finishes.

Special Note: Neutrals can be tricky! It is important to choose true neutrals. A true neutral is one that can work in combination with almost any other color in the spectrum. A brown-tone neutral with a pink or yellow base will not work this way nor will a gray-tone neutral with a blue or green base.



6.4 NON-PERMANENT FINISHES

ACC Design Standards allow non-permanent finishes to be any coloration appropriate to the facility. Most often these finishes will be in mid-range colorations. Very seldom would there be a use for pastel or very bright colors. However, primary colors of red, yellow, blue and green may be used in youth centers, child care centers or bowling centers.

Carpet, paint, vinyl wall covering, upholstery, artwork, etc. are considered non-permanent finishes. Non-permanent finishes will last from five to seven years under most conditions.

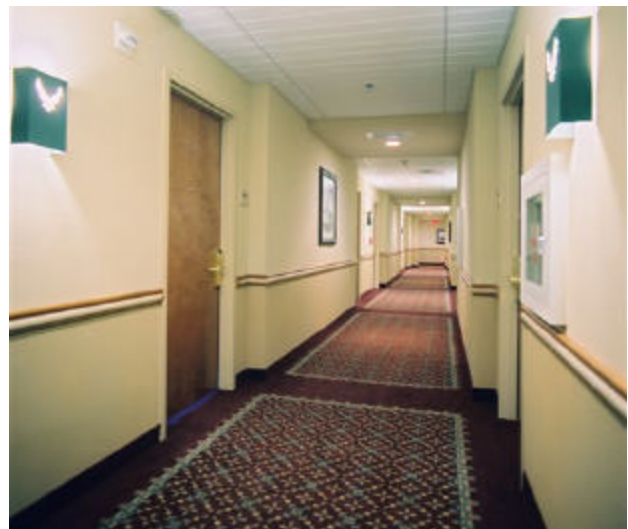
While non-permanent finishes are allowed in various colors, it is highly recommended that in office and other work areas, the vinyl wall covering or painted wall surfaces also be kept in a neutral coloration. Light reflective surfaces are important to a productive work environment. Dark colors absorb light. In other words, for work areas, develop a neutral shell for the interior space with only the carpet, upholstery, and artwork providing the color accent.

- **Gypsum Boards:** All gypsum board surfaces, which are to be painted, shall receive an “orange peel” texture prior to painting.
- **Vinyl Wall Covering:** Should be Type II in most applications. Type I has very limited use. A vertical texture will help hide seaming.
- **Paint:** Use an eggshell latex on all surfaces except metal which shall be a semi-gloss enamel.
- **Laminates:** Laminate surfaces are much more maintainable if the laminate has a flecked, speckled, mottled, texture or granite-look. Soiling and water spotting is not nearly so visible on these surfaces.
- **Ceilings:** In almost all facilities, ceilings (whether painted or ceiling tile), are to be off-white to coordinate with the



color tone of the walls. Textured ceiling tiles in 2-foot squares with a regular edge are recommended.

- *Wainscot and Chair Rail:* Wainscot is not recommended. Wood wainscots shall not be used without the approval of the Base Architect. A chair rail, properly located, may be used. It may be stained or painted to coordinate with the other woodwork or doors. The chair rail should be no more than 36-inches high in rooms and no more than 42-inches high in corridors. A Type II heavy duty vinyl wall covering is recommended for wainscoting where paint is not desired. Heavy vinyl bumper guards may also be used to protect walls in corridors where needed. They, too, should be in coordinating neutrals.
- *Vinyl/Rubber Base and Carpet Base:* Use vinyl/rubber base in areas where the floor surface is vinyl composition tile (VCT) or rubber tile. Base is to be in a coordinating neutral to the floor surface, as near the same shade as possible. Do not use a dark color or accent color for the base. Use a 4-inch carpet base capped with a neutral vinyl/rubber carpet cap in carpeted areas. Use the same carpet for the base as meets the wall in the case of borders. When carpet tile is used it will be necessary to use a vinyl/rubber base. Choose a neutral that will most closely relate to the carpet coloration or wall coloration. With carpet tile, a straight base must be used (one without a cove foot) and installed first with the carpet tile butted up to it. In ceramic tile areas, the base will be a coordinating ceramic tile base.
- *Ceramic Tile:* Use a mottled, flecked or specked floor tile. Use a dark tone grout which coordinates with the floor tile to avoid a stained or soiled appearance. Tile banding accents or patterns are approved for walls and



floors provided the accent is another neutral shade which coordinates with the dominant tile color. *Vinyl*

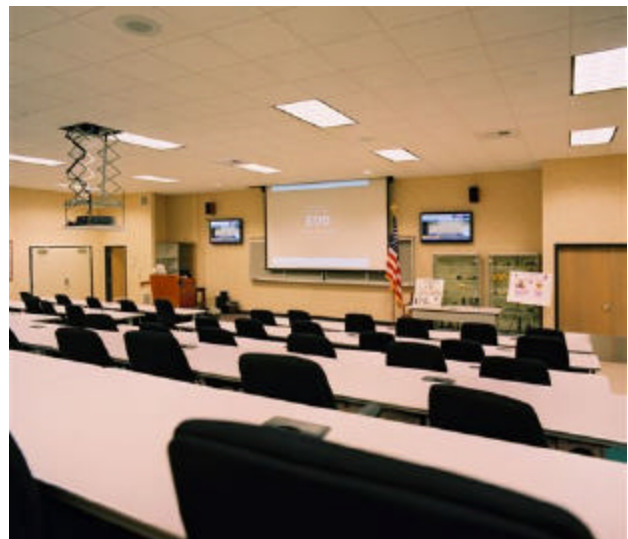
Composition Tile: Tile to be 1/8-inch thick, minimum, and pattern shall be homogenous through the tile. Border or accent tiles, to be of complementary color.

- *Doors and Door Frames:* Frames to be factory primed hollow metal. Doors to be stained solid core flush birch. In single family homes, depending on the quality of the doors, they may be either stained or painted. If painted, they may be painted either a color close to the wall color or an accent color of mid-range hue.
- *Window Blinds:* Metal or vinyl blinds may be horizontal or vertical and are best in off-white or light neutrals. Dust is not as visible on the light colors as on the dark colors, and vertical blinds collect less dust than horizontal ones. Dark blinds that match the anodized finish of the window frames are acceptable, provided the windows are of reflective glass. If the windows are not of reflective glass, dark blinds will radiate a great deal of heat into the building rather than reflecting it as light or off-white blinds do.
- *Carpet:* (See ETL 03-3: Air Force Carpet Standard and revised ACC Carpet Guidance - dated 16 April 03). In general, use mainly bold tweed, nylon, level-loop carpet of a least 28 oz. face weight. Bold tweed means yarns of several different colors, not various shades of the same color. Level-loop is the most hard-wearing type of carpet, and bold tweed allows for several upholstery color coordinations in a facility using only one carpet color-way. Again, use a 4-inch carpet base capped with a vinyl/rubber, neutral carpet cap.



- *Dormitory Carpet: Carpet dormitories by using one carpet pattern per building with a different color-way per floor. Take care to ensure that carpet used in living areas is not the same carpet used in the work areas on base. Do not use drab, dull colors in living areas. Bedspreads and chair upholstery can be coordinated per floor to the carpet color-way. Draperies in these small living areas are best kept in neutral colorations to blend in with the walls. This provides a neutral background for personal items of the occupants.*
- *Carpet Borders: Carpet borders may be solid in color. They may be used with either carpet tile or roll goods. Be careful not to over-do borders. In corridors, a border width of 9-inches is about right. Install field carpet in rectangular shapes and allow border to fill in indentation such as doorways, drinking fountains, etc. Do not use borders in rooms where the furniture will cover the border.*
- *Systems/Prewired Workstations/Modular Furniture: All panel fabrics, work surfaces, flipper doors, etc., are to be in either brown-tone or gray-tone neutrals. Only one type of systems furniture should be used per building in order to allow greater flexibility in reconfiguration, as occupants needs and requirements change, and to provide continuity throughout the space. Systems furniture should be installed over carpet tiles. Removal and installation of new carpet in 12-foot widths becomes a major undertaking. This is not efficient or cost effective. Carpet tile will allow for self-help replacement and ease of maneuvering under the systems furniture. Carpet tile will also accommodate flat-wiring for electrical and communications under the carpet.*

- *Special Notes for Single Family Homes: Interior paint to be Spectre-Tone Navajo White. Solid wood kick boards shall be provided at all kitchen and bath cabinets.*





SECTION 7.0

Landscape Architecture

7.1 GENERAL RECOMMENDATIONS

The Nellis AFB Landscape Master Plan Criteria provides detailed landscaping guidelines with specific requirements to be implemented during the construction and maintenance phases of new or renovation projects. These Landscape Architecture Standards are intended to establish a conceptual framework within which those guidelines are executed.

In order to unify the diverse architecture of the Nellis AFB a strong emphasis should be placed on the landscaped environment. The outcome of this increased emphasis will be an overall visual continuity which will serve as a backdrop for the buildings. Careful consideration should be given to respond to site context, open space, landmarks, views, vistas, streetscapes, and the preservation and protection of existing trees.

7.2 PLANTING DESIGN

Note: Proprietary names for colors, textures and patterns are for the purpose of selections only. Other manufacturers' products may be acceptable, provided they closely approximate colors, textures and patterns indicated and conform to all other specification requirements.

The area is a hot arid climate and plant material used should suit the environment. Xeriscaping principles shall be followed which encourage the use of native, low water using, drought tolerant plant material.

The landscape shall vary to denote different areas such as building entrances, entry drives, pedestrian walkways and intersections. Informal and natural arrangements of plantings shall be used to complement the desert environment. Different species of plants should be used to eliminate monocultural plantings and create diversity. However, where groups of the same species are used, massing is required. Rectilinear masses of plants and straight lines shall be avoided.



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Mechanical equipment, transformers, loading docks and dumpsters shall be screened with a combination of plant material and walls. Plant materials shall be installed at a size and spacing which softens the screen walls.

Landscaping at buildings across the base should enhance the architectural character and specific use of the site. Attempts should be made to blend the landscaping into the natural environment whenever possible.

The fronts of buildings should be landscaped in an inviting and aesthetic way. The building entrance should be enhanced to help create a focal point. Avoid annual planting beds at most building entrances. Desert landscaping can be used in conjunction with drainage ways to help reduce the rigidity of the existing linear channels while still keeping the functionality of the channel intact.

The Flight Line is a unique district since all landscaping takes place along Tyndall Avenue. There is an existing concrete masonry unit wall that defines the edge of the landscape area. Buildings which have a primary entrance along Tyndall Avenue should be enhanced with retaining walls and desert plant materials in a style similar to the Thunderbirds' Building.

Within the Residential District, landscaping of front yards should provide a diversity of plant material which will help create individuality from house to house. The use of turf in the front yards shall be limited with the majority of turf being used in the rear yards.

7.2.1 Approved Material and Treatments

- Plant material: See Appendix 1B for Plant List
- Rock mulch:
 - 3/4-inch granite: "rebel red" colored, 3-inches deep
 - 1 1/2-inch granite: "rebel red" colored, 3-inches deep

3-inch to 12-inch river rock: red/tan/gray colored, 4-inches deep, naturally smooth, stream bed river run stone

- Boulders: 2-foot to 4-foot diameter decorative red rocks partially buried.



7.3 IRRIGATION

7.3.1 General Recommendations

Irrigation is an integral part of the landscape environment at Nellis AFB. The survival and growth of plant materials depend on an efficient, reliable, and easily maintained irrigation system.

Each site shall be completely irrigated with an automatic underground irrigation system to irrigate all trees, shrubs, and turf areas to any adjoining road edges. Shrubs and all planting beds shall be on separate zones from turf areas. Spray heads irrigating turf shall not spray into planting beds, foundations, structures, parking lots, sign faces, roadways, sidewalks, or walkways. Reduced pressure backflow preventors are required. Backflow preventors shall be placed in a planting bed and screened with evergreen shrubs.

Turf areas will be irrigated with pop-up heads and shall have head to head coverage. Spray irrigated turf areas shall be a minimum of 8-feet wide. Systems shall be designed so that peak summertime lawn irrigation can be completed between the hours of 6 p.m. and 9 a.m.

Irrigation runoff should not flow into any street. Drip irrigation shall be installed for all plant material other than turf. Appropriate filtration and pressure regulating devices shall be installed. No fixed risers are allowed. Drip zones shall be designed so that additional emitters to trees can be installed as the tree matures.

An electric, solid state controller is required and shall be equipped with a master valve terminal and at least two fully independent programs. The irrigation system controller shall be placed inside the building. All irrigated areas shall utilize remote electric control valves installed in valve boxes. No manual valves are allowed.

A “master” electric control valve shall be installed immediately downstream of each backflow preventor if a foundation structure is present within the irrigated area. The valve must be capable of fully opening under the lowest design

flows (drip). Quick coupling valves shall be installed at a minimum 100-foot spacing and at dead end of all mainline runs to facilitate hand watering of plant material.



Pressure supply lines, non-pressure piping, and control wires passing under paved surfaces, walls, curbing, etc., shall be sleeved. Each use shall have an individual sleeve. All piping shall be PVC.

7.4 SITE FURNITURE

7.4.1 General Recommendations

Site furniture base-wide should be brought to a uniform standard. Furniture such as benches, trash receptacles, bicycle racks and tables shall be capable of being used across districts. All furniture shall have a protective plastic finish. Gazebos and shade structures should be constructed of materials which reflect the architecture of surrounding buildings.

Within the Flight Line, Facilities Engineering, Recreational Areas and Area II Districts, a more durable bench may be used which is constructed with concrete masonry units.

Large barbecues should be constructed to match those which already exist within the Recreational Areas. Pedestal mounted grills can be used for smaller areas or adjacent to living quarters.

7.4.2 Approved Materials and Treatments

Metal bench with back and metal armrests shall be manufactured by Landscape Forms, Inc. (800) 521-2546. Style as "Manistee." Color shall be approved by the Base Architect.

Fixed table and bench shall be manufactured by Landscape Forms, Inc. (800) 521-2546. Style as "Carousel" with fabric umbrella. Color shall be approved by the Base Architect.

Metal trash receptacle and ash urns shall be manufactured by Landscape Forms, Inc. (800) 521-2546. Style as "Plexus." Color shall be as approved by the Base Architect.

Metal bicycle rack shall be manufactured by Columbia Cascade (503) 223-1157. Style as "Timberform Cyclops." Color shall be approved by the Base Architect.





SECTION 8.0

Signage Standards

The signage standards are governed by Air Force Sign Standard UFC 3-120-01 and ACCI 32-1054. The following provides an overview of these two documents.

The graphics system shall serve to identify buildings, inform users, and direct vehicular traffic in an aesthetically pleasing manner. Signs are to be compatible to architectural elements and enhance the overall design of the buildings. Effective signage should serve as a unifying element. The Base Architect shall review and approve all proposed signs.

8.1 GENERAL RECOMMENDATIONS

Signage should be used to unify the base and provide an effective identification system. Continuity of materials, fonts, and colors will help simplify the circulation through the base.

The letter style, for all exterior building signs and temporary signs shall be Helvetica. Helvetica Medium shall be used for primary information and Helvetica Regular shall be used for secondary information.

Individual lettering attached to building structures, monuments and entryway glass shall be metallic, beige or white. All other types of signs shall have white lettering on a brown background, except signs pertaining to safety which are governed by national standards.

Major signs such as those at base entrances can be designed to be more decorative and can vary from the general recommendations. Specialty signs with message boards shall be as approved by the Base Architect.

Materials for signs shall be aluminum, galvanized steel, and non-ferrous materials. Wood posts shall not be used. Internally lighted signs are limited to special commercial applications and must be approved by the Base Architect. If lighting is required for other signs, use external flood or spot lights.

The exterior sign types for use on the base are as outlined below:

8.1.1 Identifications Signs

Identification signs may be one or two sided. Two sided signs shall be installed perpendicular to the roadway.

- (1) Base Identification Signs: These are located at Base entry points to identify the facility. Three types of base identification signs are to be used - the Main Entrance Sign, Secondary Entrance Sign, and Entry Gate Sign. These signs are all one sided since they are viewed from one direction only.
- (2) Military Identification Signs: Military identification signs are strictly prohibited.
- (3) Community Identification Signs: These identify facilities and activities used for non-military purposes. These signs have the same character as military signs but consist of a different background color, lack military emblems and building numbers.

The use of community and commercial related symbols is permitted.

8.1.2 Direction Signs

These are used to direct vehicular traffic to specific locations.



All signs shall be faced with brown reflective sheeting for the background and white reflective materials for the graphics.

8.1.3 Regulatory Signs

These signs are used to direct vehicular traffic to specific locations.

Highway Standards, Base Warning Signs and Parking Regulation Signs are considered Regulatory Signs.

Traffic control signs are governed by the Manual of Uniform Traffic Control Devices (MUTCD) and signs governed by OSHA. Examples include regulatory and traffic control signs (speed limit signs, stop signs, yield signs) and hazard/danger signs required by OSHA. Such special signs mandated by National Standards must be of the required colors and design. All signs on Base will adhere to standards set forth in ACCI 32-1054, Exterior Signs, (except that color shall be white letters on brown backgrounds and posts shall be brown), AFPAM 32-1097, Sign Standards Pamphlet, and MUTCD.

8.1.4 Motivational Signs

These signs serve to increase morale.

Motivational signs should be used to identify principal organizations, support safety campaigns, fund-raising drives, special events, display emblems and to express unit pride.

Electronic messaging can be used for this sign type.

8.1.5 Information Signs

These signs provide educational information and directional guidance for visitors.

8.1.6 Wall Mounted Signs

Wall mounted signs shall be limited to the following applications:

- (1) Exterior lettering is limited to the main facility function title or unit identification. If two main functions share a facility, both titles will be displayed. All lettering will be three-dimensional uppercase Helvetica medium style with letter size proportional to signage location and facility size. Letters on facilities with metal walls will be constructed from styrofoam with paintable surfaces and metal backing. Medium bronze color will be used for letters and metal background will match building wall color. All other exterior walls will receive medium bronzed anodized aluminum letters. Installation shall be permanent and appropriate for building finish (i.e. split-face CUM, stucco, metal, etc.).
- (2) Installation of unit patches is limited to the Unit Headquarters facility and only one patch per facility is allowed. Patch should be located near the main entrance and near the unit/building name signage. Size should be appropriate to the size and scale of the facility but vertical dimension shall not be greater than 3-feet 6-inches. The professionally manufactured patch shall be factory painted on a silhouetted aluminum panel. Panel shall have an appropriate gauge thickness and be mounted approximately 1-inch from the wall surface to separate it from the plane of the wall and create a shadow. The following unit patches are exempt from limits on size and number: USAG Thunderbirds, RED FLAG, USAF Weapons School and Joint Air Ground Operations School.



8.1.7 Temporary Signs

Temporary signs will not be permitted except as described below.

All temporary signs shall be fabricated to follow the style and guidelines as specified and illustrated.

Temporary construction signs shall be permitted during the construction of a facility and shall be removed no later than one week after issuance of the certificate of occupancy. One project sign shall be permitted and shall be parallel to the street with locations subject to approval of the Base Architect and should include only the following information:

- Building Name
- Major Tenant(s)
- Architect
- Consulting Engineers(s)
- Landscape Architect
- Developer (when applicable)
- General Contractor

Subcontractor signs shall not be permitted. The temporary construction sign outlined above shall be located within a minimum of 5-feet of the property line and adjacent to the construction trailer. Construction signs will not be permitted off site except as needed to direct construction traffic.

All temporary signs shall be free standing ground mounted and signs of this nature shall not be affixed to any building.





SECTION 9.0

Site Lighting Standards

9.1 GENERAL RECOMMENDATIONS

The design objective for all site lighting is to provide a uniform system of functional lighting in an aesthetically pleasing and visually unobtrusive manner.

Exterior accent lighting of plant materials, signs and buildings shall be achieved with hidden light sources. These include surface mounted fixtures, lamps recessed in building soffits, overhangs, walls, lamps recessed in the ground and lamps hidden by plant material.

Roadway light fixtures should be uniform across the Mixed Use Central Core, Flight Line, Flight Line Support, and Facilities Engineering districts. Consistent fixtures provide cohesiveness and help link the districts together. The Residential Neighborhoods should have a fixture for its streets which sets itself apart from the rest of the base and provides a greater sense of neighborhood. Within the Recreational Area an additional fixture for walkways and jogging trails should be used. This fixture will identify the trail system which interconnects the different uses within the district.

All exterior lighting shall be energy efficient high pressure sodium. Lighting levels will be determined as specified in the "Lighting Handbook of the Illuminating Engineering Society," most recent edition. Lighting levels in parking lots shall be a minimum of 1 foot candle.

9.1.1 Approved Material and Treatments

The fixtures indicated below are for all Districts unless noted later in this section.

Note: Proprietary names for colors, textures and patterns are for the purpose of selection only. Other manufacturers' products may be acceptable, provided they closely approximate colors, textures and patterns indicated and conform to all other specification requirements.

Parking lot fixtures shall be a maximum height of 20-feet and shall be absolute cut-off type fixtures as manufactured by Kim Lighting (818) 968-5666.

Style shall be "EKG series model 401." Color shall be bronze.

Roadway light fixtures shall be a maximum height of 35-feet and shall be absolute cut-off type fixtures as manufactured by Kim Lighting (818) 968-5666. Style shall be "EKG series model 401." Color shall be bronze.

Poles for roadway and parking lot lighting shall be square steel non-tapered. Color shall be bronze.

Low bollard fixtures or landscape lighting for walks and building entries shall be as manufactured by Kim Lighting (818) 968-5666. Style shall be vandal resistant model VRB1. Metal color of light fixture shall be bronze. Diameter of bollards shall not exceed 6-inches and height shall not exceed 42-inches.

Building mounted lights shall be absolute cut-off type fixtures and shall be recessed and as manufactured by Kim Lighting (818) 968-5666. Style shall be "Wall Director." Color shall be bronze. Wall mounted lights for lighting stairs and sidewalks shall be manufactured by Kim Lighting (818) 968-5666. Color shall be bronze.



Building and sign flood lighting shall be as manufactured by Kim Lighting (818) 968-5666. Style shall be “Architectural Flood Light.” Color shall be bronze.



Landscape accent lighting shall be as manufactured by Kim Lighting (818) 968-5666. Style shall be Model CL-4. Color shall be bronze.

9.1.2 Residential Districts

Roadway light fixtures shall be a maximum height of 20-feet and shall be absolute cut-off type fixtures and shall match existing standard currently in use on the base.

9.1.3 Recreational Districts

Jogging trail and walkway lighting shall be a maximum height of 15-feet and shall be absolute cut-off type fixtures and shall match existing standard currently in use on the base.



APPENDIX A

Engineering Standards

A.1 CIVIL

- a. All civil work should indicate all calculation in design analysis and show design criteria on drawings and shall conform to the latest editions of the following:
 - (1) State of Nevada Department of Transportation (NDOT) Standard Specifications;
 - (2) The NDOT Standard Details;
 - (3) The Clark County Public Works standard drawings for civil work.
 - (4) The International Building Code (IBC);
 - (5) UFC 4-010-01, DoD Minimum Antiterrorism Standards for Buildings;
 - (6) The International Plumbing code.
- b. All civil work shall conform to the requirements of:
 - (1) The Uniform Federal Accessibility Standards (UFAS);
 - (2) The Americans with Disabilities Act (ADA);
 - (3) The most stringent requirements shall apply.
- c. Site Plans
 - (1) General base plans and some more specific as-built plans for the existing buildings and utilities are available on request; however they may be incomplete and inaccurate.
 - (2) Existing conditions will need to be surveyed and verified by the A/E.
 - (3) A new site plan shall be developed on AutoCAD for project areas at 1-inch equals 40-feet or larger (1-inch equals 20-feet) showing all existing utilities, sprinklers, facilities, features, trees, ponds, etc.
 - (4) One foot contours shall be accurately shown, with bold five foot contours.
 - (5) Key spot elevations shall also be shown accurate to 1/10-inch for land features and accurate to 1/100-inch for structures, pavements, and slabs.
 - (6) Finish drawings must include horizontal and vertical control references to actual survey data control points.
 - (7) Benchmarks and key work/control points must be shown on site plans with coordinates (State plane). Both AutoCAD disk copies and mylar hard copies shall be furnished to the Government upon completion of the project.
- d. Gas Service
 - (1) The design agent should expect to coordinate and arrange new facility connection to the natural gas lines.
 - (2) Contract plans should clearly identify connections necessary and the party responsible for the work.
 - (3) Gas lines shall have maximum working pressure 60 PSIG.
 - (4) Underground gas piping shall be non-metallic.
 - (5) Refer to Mechanical/Plumbing Section for additional information.
- e. Sanitary Sewer Service

The minimum service size for a new facility shall be 6-inches. If required, a new 6-inch or 8-inch main shall be designed and constructed to serve the site from the closest manhole which can be reached via gravity flow.

 - (1) The A/E shall study the most economical gravity sewer design option.
 - (2) Verify capacities of existing sewer to handle additional flows once they are determined.
 - (3) Sewer lines shall be installed according to manufacturer's recommendations with not less than a 2.5 fps hydraulic velocity flow; minimum main from building shall be 4-inches.
 - (4) Sewer manholes shall be precast reinforced concrete manhole sections with two exterior coats of heavy duty bituminous. Manholes shall conform to ASTM C478-72. Position manholes at every 45° and 90°, and a minimum of 300-feet apart.
- f. Manholes/Cleanouts
 - (1) Use standard precast manholes with nominal 25-foot diameter cast iron cover.

- (2) Maximum manhole spacing shall be 400-feet.
 - (3) A new manhole or cleanout shall be required if there is a significant change in direction for the new line.
 - (4) Minimum wastewater flow velocity is two feet per second.
- g. Water Supply
- (1) Verify that existing water mains are adequate to handle fresh water demands of the project, including fire protection and irrigation.
 - (2) Wet barrel fire hydrants shall be supplied to the building site off existing water mains in accordance with NFPA.
 - (a) Fire hydrants shall be Kennedy or Muller only.
 - (b) Fire hydrants shall be provided with Hydroschild hose connection couplers.
 - (3) A water demand analysis shall be made to determine flow and capacity requirements, line sizes, routing, as well as which line or lines are best to tie into.
 - (4) Cathodic protection is required on any metallic piping.
 - (5) Use PVC type C-900 for underground service, and galvanized steel for aboveground (outside).
 - (6) Install a water meter at each new facility.
 - (7) Disinfect the plumbing lines in accordance with AWWA and UPC standards and provide for bacteriological and pressure testing of the water after the building is complete.
 - (8) Water piping shall be designed for a maximum velocity of 3 fps, or manufacturer's recommendation, whichever is less. Plastic piping shall be pressure pipe capable of withstanding 165 psi. Trenching, backfilling, and pipe installation shall be done according to manufacturer's recommendations. Pipe shall have minimum cover of 3-feet.
 - (9) No pressure piping shall be allowed under slabs unless it is in a crawl space or pipe chase except for the service entrance. The service entrance shall be perpendicular to the slab edge and not extend more than 5-feet under the slab.
- h. Storm Drainage
- (1) The building site shall be designed such that 100-year flood plain shall be at least one foot below finish floor elevation.
 - (2) Culverts, storm drains, and catch basins shall be sized to handle a 25-year storm.
- i. Site Drainage
- (1) Drainage shall generally be surface drainage away from building with paved areas sloping a minimum of 1%; earth areas a minimum of 2%; and pipes, gutters and swales a minimum of 0.5%.
 - (2) Use bituminous coated CSP or RSP for culverts.
 - (3) Use precast concrete catch basins with cast iron grates.
 - (4) Provide concrete splash blocks at outlets of downspouts.
 - (5) Where slope exceeds 20%, a system of erosion control should be provided.
- j. Soil and Foundation Conditions
- (1) Site specific soil borings are required to determine soil bearing, pH and resistivity characteristics.
- k. Pavement/Parking Materials
- (1) Asphalt road pavements: For parking lots and secondary housing roads, the minimum requirement is 2-inches thick asphalt concrete on 6-inch class 2 aggregate base. For asphalt roads, pavement shall be a minimum of 4-inches thick with a 6-inch aggregate base course (also for areas used by large trucks and tractor trailers).
 - (2) Parking lots shall be located at the back or sides of the facility.
 - (3) Parking spaces shall be 9-feet wide, 18-feet long and have a 26-foot drive lane.

- Parking spaces shall be constructed at 90°. Vast expanses of asphalt shall be divided by islands incorporating desert plan material.
- (4) Concrete curb is required along driveways, around parking areas and around landscape
 - (5) Islands in the parking lot. (Tack-on curbs are not allowed).
 - (6) Lane delineation shall be ceramic traffic buttons and reflectors.
 - (7) All joints between precast concrete and asphalt pavements shall be routed out and sealed.
 - (8) Control joints shall be provided in concrete pavement to minimize random cracks. "Too many" control joints is preferred to random cracks.
 - (9) Boring shall be used when possible to eliminate road cuts.
 - (10) Cots in asphalt pavement shall be backfilled with a slurry cement backfill to prevent settlement. Asphalt patches should be a minimum of 25-feet and a maximum of 50-feet.
 - (11) Sidewalks shall be 5-feet wide along major streets and 4-feet wide along secondary and tertiary streets.
 - (12) Design the parking lot such that the total number of spaces is equal to the expected building population plus 10%.
 - (13) Handicap spaces shall be provided in accordance with the requirements of the American with Disabilities Act (ADA) and the Uniform Federal Accessibility Standards (UFAS).
 - (14) Site design should provide adequate separation between pedestrian and automobile traffic through sidewalks, curbs, landscaping, or other buffering elements.
 - (15) Specialized vehicles, such as delivery trucks, require separation from other vehicles.

I. Construction Considerations

- (1) Detailed construction phasing and an order of work schedule shall be provided in contract documents for all major

- projects to reduce negative impact on nearby facilities and traffic.
- (2) Supply Piping shall be non-metallic such as:
 - (a) Polybutylene (PE)
 - (b) Chlorinated Polyvinyl Chloride (CPVC)
 - (3) Waste, vent and drainage piping shall be non-metallic, such as:
 - (a) Acrylonitrile-Butadiene-Styrene (ABS)
 - (c) Polyvinyl Chloride (PVC)
 - (d) Polypropylene (PP)
 - (e) Filament-wound Reinforced Thermo-setting Resin (RTRP)
 - (5) Provide remote monitoring, including utility meters, HVAC, generators, etc.
 - (6) Provide utility meters for all renovated and new facilities.

A.2 STRUCTURAL

a. General Requirements

- (1) The structural system and materials shall be suitable for permanent type facilities, capable of carrying the required loads, and compatible with fire protection requirements and architectural and functional concepts.
- (2) Materials not already defined in these standards shall be selected for economy, general availability, desirability, resistance to fire and low maintenance costs over the design life of the facility.
- (3) In selecting the type of structural system, the total cost of the facility shall be considered in conjunction with utilities, HVAC, lighting, finish materials and other architectural features.
- (4) In choosing miscellaneous structural materials for this project, consideration shall be given to the site environment, climate, subsurface conditions, accessibility, wind velocity and seismic ratings, skill and experience of prospective contractors, the design life of the facility and maintenance cost over this period, availability of labor and materials and the feasibility of

preassembling or precasting major structural elements.

- (5) Asbestos and lead paint shall be tested for prior to any demolition. Determine presence of asbestos and lead paint (and any other toxic substances) prior to any demolition. If present, include required degree of remediation in the project.
- (6) A preconstruction meeting is required prior to any asbestos or lead base paint work.
- (7) All nonresidential buildings shall be metal framing.
- (8) Soil treatment for termites shall be specified for any new building with wood framing.

b. Design Loads

- (1) Comply with the latest edition of the International Building Code and UFC 1-200-01, Design: General Building Requirements.
- (2) Consideration should be given to the use of bearing walls since past designs indicate their economic advantages.
- (3) Any design using a column and beam system must be analyzed to determine the most economical system.
- (4) Floor, ceiling and roof structures should be investigated to determine the most economical system consistent with the desired acoustical attenuation.
- (5) Walls and partitions should be held to a minimum thickness to obtain maximum livable areas within the gross area limitation.
- (6) The selection of walls and partition systems must take into consideration acoustical separation, fire protection, maintenance, structural requirements, and utility systems.

c. Design Notes

- (1) Include general structural notes on drawings such as roof, floor, wind and seismic loads; material types and design stresses; unusual members sections properties; survey references; and other pertinent notes relating to conformance to codes or construction practices.

d. Compatibility with Finishes

- (1) Structural systems that require the use of cast in place concrete in conjunction with concrete masonry units should be carefully designed and detailed to present an attractive and acceptable appearance allowing for expansion/contraction and not allowing any leakage.

A.3 PLUMBING/MECHANICAL

a. General Requirements

- (1) The design of mechanical systems must take into consideration all factors that will ensure a quiet, comfortable and convenient environment for the occupants.
- (2) All mechanical equipment and systems must be selected on the basis of acoustical impact on the building occupants.

b. Reference Standards

- (1) International Code Council
- (2) International Mechanical Code
- (3) International Plumbing Code
- (4) NFPA Codes
- (5) OSHA & AFOSHA regulations
- (6) Americans with Disabilities Act
- (7) Uniform Federal Accessibility Standards
- (8) UFC 3-600-01 Fire Protection Engineering for Facilities
- (9) ASHRAE standards
- (10) Department of Defense Unified Facilities Criteria (UFC)
 - DoD Minimum Antiterrorism Standards for Buildings, UFC 4-010-01
 - Design: Energy Conservation, UFC 3-400-01
 - Design: Engineering Weather Data, UFC 3-400-02
 - Design: Heating, Ventilating, and Air Conditioning, UFC 3-410-01FA
 - Design: Heating, Ventilating and Air Conditioning Control Systems, UFC 3-410-02A
 - Design: Plumbing, UFC 3-420-01FA
- (11) Military Handbook Facility Planning and Design Guide, Mil-HDBK-1190

- (12) Engineering and Design Sustainable Design for Military Facilities, ETL 1110-3-491
- c. Special System Criteria
 - (1) Provide air conditioning and ventilation for proper operation of computers, machinery, etc.
 - (2) Provide for the ventilation of mechanical rooms where refrigerant may be present.
 - (3) Reference TRANE application engineering manual "Refrigeration Equipment Room Design" (REF-AM-2, Aug 1992).
- d. Maintenance Consideration
 - (1) Each piece of equipment must be installed so it can be properly maintained.
 - (2) Clearances must be provided around all equipment to allow it to be serviced, removed, and replaced as required.
 - (3) Plans and specifications should be examined to minimize large maintenance costs in the future.
 - (4) Provide convenient access to all utilities, cleanouts, HVAC equipment and systems, and gas fittings, in the mechanical room, underground and in the building.
 - (5) Additionally, any work performed in the overhead space must be done with the least disruptions to personnel utilizing the facility.
 - (6) Provide direct vehicular access to mechanical rooms if possible.
 - (7) Ensure adequate means of removing interior equipment.
 - (8) Construction contract shall include training period for base maintenance personnel.
 - (9) Training period shall range from four hours of on-site instruction for simple systems up to two days for complex systems.
 - (10) Videotape of training sessions shall be included.
- e. Energy Conservation Measures
 - (1) All new facilities shall comply with the 2003 International Energy Conservation Code and Executive Order No. 13123.
- (2) Reference the following Engineering Technical Letter (ETL) for current design guidance: "U" values, ETL 83-9; Energy Budget Figures, ETL 87-4; Meters, ETL 87-5 (Draft rev. 93-XX); Equipment Efficiency, ETL 82-2; HVAC control, ETL 83-1.
- (3) A computer energy system analysis, under ETL 84-2 (Draft rev. 93-XX) shall be required
- (4) Use a present value (discounting) technique using 10% mid-year values.
- (5) Equipment economic life shall be equal to the building projected occupancy, but not more than a 25 year cost period.
- (6) Designer shall conform to the Energy Budget Figures set forth in ETL 87-4 (Draft ref. 93-XX)
- (7) Submit proposed EBFs corresponding to the different facility operating hours.
- (8) Restroom and conference room lights shall be controlled by motion detectors. Consider having all facility lights controlled my motion detectors.
- (9) Install electric, gas and water meters for facilities where meter would cost less than 20% of facility's annual energy cost. All meters shall be JCI Metasys compatible and connect to base EMCS.
- f. Corrosion Control/Cathodic Protection
 - (1) Apply cathodic protection on all buried or submerged ferrous piping, tanks and related facilities.
 - (2) Under no circumstances will underground facilities be installed without cathodic protection.
 - (3) This requirement includes ferrous materials such as cast iron.
 - (4) All buried or submerged cast iron pipe joints will be bonded with number 2 AWG insulated wire.
 - (5) Thermit wire connections must be coated.
 - (6) All cathodic protection design must be performed by an engineer accredited by the National Association for Corrosion Engineers.
 - (7) All cathodic protection design must be based upon specific field tests made at the construction site. Tests will include soil resitivity and water conductivity.

- (8) Cathodic protection systems shall be sacrificial anode or impressed current and shall comply with corrosion protection criteria outlined in NACE Standard RP-01-69-9 (revised), ETL 87-3, AFM 88-45, AFI-105 and UFC 3-570-06 O&M.
- (9) All dissimilar metals shall be separated by dielectric union.
- g. Potable Water Source
 - (1) Coordinate with the Engineering and Site Development Sections at Nellis AFB for location of water mains and the operating pressure ranges in the area of connection.
- h. Piping Materials and Special Outlets System - Material
 - (1) Water (underground)-PVC type C-900
 - (2) Water (above ground, outside) - Galvanized steel
 - (3) Water (above ground, inside)- Hard copper Type 1
 - (4) Sanitary Drain, Waste - (building, 3 stories and less) ABS - Vent Sanitary Sewer
 - (5) Sanitary Drain, Waste - (buildings taller than 3 stories) - cast iron
 - (6) Storm Drain- RCP or CMP
 - (7) Chilled Water PVC Schedule 80 or hard copper - Type L
 - (8) Heating Hot Water- Schedule 40 black steel or hard copper - Type L
 - (9) Natural Gas (underground)- Polyethylene with tracer wire
 - (10) Natural Gas (above ground)- black iron
 - (11) Provide dielectric union when connecting dissimilar metals.
 - (12) Provide lead free plumbing components.
 - (13) Provide identification labels for pipes in the Mechanical Rooms.
- i. Piping System
 - (1) Provide valves to isolate portions of building to avoid shutdown of entire building.
 - (2) Drain, waste and vent piping as required by Uniform Plumbing Code for sanitary sewer system from each new facility.
 - (3) Fire protection systems are required for each facility per NFPA codes.
- j. Piping System
 - (1) Energy conservation washerless fixtures shall be all metal construction, no chrome-plated plastic. All techniques shall be considered, including 1 gpm flow restrictors for faucets, 3 gpm low-flow shower heads, single control mixing type faucets, low-volume flush water closets, and self-closing faucet valves. Showers shall have valves with pressure balance feature. Utilize freezeless wall hydrant. Provide interior wall access (self-draining) with hose attached. Wall mounted drinking fountains are preferred.
 - (2) In buildings normally occupied by more than 15 persons, provide separate toilet rooms for each sex; position them together and use a common wall for plumbing chase. In buildings occupied by 1-15 persons, a single toilet to serve both sexes may be provided. Furnish one water closet, one lavatory, and a room door that can be locked from the inside.
 - (3) All applications of plumbing fixtures shall be considered for handicapped usage as directed by Air Force Guidelines.
 - (4) Plumbing fixture types:
 - (a) Water closets (Institutional) - Flushometer valve, siphon-jet, elongated bowl, top supply spud, floor or wall mounted, 1.5 gpm/flush. Seat: plastic, elongated, open front.
 - (b) Water closets (Handicapped, Institutional) - Top rim of bowl shall be 18-inches above the floor. (All others same as #1)
 - (f) Water closet (Residential) - Siphon-jet, elongated bowl, flush tank, floor mounted, 1.5 gpm/flush. Seat: plastic, elongated, open front with seat cover
 - (g) Lavatories (Institutional) - Enameled cast iron or vitreous china, counter top. Facet: as required.
 - (h) Wheelchair sinks (Residential) - Vitreous china.
 - (i) Urinal (Institutional) - Wall hung. Siphon-jet or washout. 1 gpm/flush.

- (j) Kitchen sinks (Residential, Institutional) - Single or double bowl. Ledge back with holes for faucet and spout. Enameled cast iron, porcelain enameled steel or stainless steel. Faucet - as required.
 - (k) Service sinks (Institutional) - Enameled cast iron. Trap standard, wall mounted or floor mounted. Faucet - as required.
 - (l) Food service sinks (Institutional) - Stainless steel with drain board. Faucet - as required.
 - (m) Water coolers (Institutional) - Self contained. Exposed surfaces shall be stainless steel. Wall mounted surface. Wall mounted semi-recessed. Wall mounted recessed. Handicapped. Free standing.
 - (n) Showers (Institutional, Residential) - Wall mounted for stall or bathtub. Valves as required.
 - (o) Bathtubs (Institutional, Residential) - Straight front recessed. Enameled cast iron, porcelain enameled. Formed steel, plastic without wall, plastic with high wall.
- confirmed for each project. Do not use heat pumps if gas is available.
- (g) Provide screw type compressors for chillers greater than 40-tons.
 - (h) Provide economizer when appropriate.
 - (i) Provide water treatment for all water systems, heating or cooling. Large systems should have loops installed as part of the system.
 - (j) Provide washable pleated air filters.
 - (k) Provide phase protection for all HVAC equipment (i.e. pumps, chillers, air handling units)
 - (l) Refrigerant shall be HCFC type only.
 - (m) Provide recommended manufacturing clearance around boilers, chillers and air handlers for maintenance purposes.
 - (n) If LNG or propane tank is provided for a facility it shall be located at least 50-feet from facility and enclosed by CMU screen walls.

k. HVAC

(1) General

- (a) Air conditioning units shall be Trane or Carrier; designed for an ambient temperature of 115°F. Mcquay will not be accepted.
- (b) Provide VAV systems in all new projects and during major renovations where entire mechanical system is being removed.
- (c) Provide Energy Management Control System for units greater than 10 tons and connect to LAN.
- (d) Provide water cooled chillers for units greater than 40 tons.
- (e) Roof mounted mechanical equipment shall not be allowed for any facility.
 - (e-1) Fresh air intake shall be at least 10-feet above ground level.
- (f) Provide gas heating where gas is available. This needs to be

(2) Controls

- (a) Provide Direct Digital Controls that are manufactured by Johnson Controls and part of the Metasys System. DDC shall have direct communication with base EMCS.
- (b) Existing base EMCS is Johnson Controls Metasys System which is a microprocessor based network installed on the base LAN and designed for maintenance management, trouble-shooting, and energy management. The system is comprised of a network of stand-alone units, each capable of DDC and supervisory control with direct LAN connection accessible by any desktop computer with appropriate software installed. The system allows for the base to perform manual operation, coordinate systems for energy reduction, view facility status in real time and generate run-time reports on equipment.
- (c) Provide a fully labeled control schematic which details all set points, throttling ranges, actions, spaces, proportional bands, and any other adjustment.

- (d) Provide a fully labeled elementary diagram (ladder diagram).
- (e) Provide a sequence of control on the drawings cross-referenced to the control schematic and elementary diagram.
- (f) Provide a generic, functional description of each control component shown on the drawings.
- (g) Provide for remote monitoring, including utility meters, HVAC, generators, etc. Use remote sensors so that controllers can be centrally located in the mechanical room.
- (h) Provide logical grouping of controllers, adapters, relays and power supplies in an easily accessible controls cabinet mounted away from vibrating machinery.
- (i) Provide electronic system terminal strips cross-referenced to the control schematic to facilitate troubleshooting and calibration. Maximize “self-help” software as well.
- (j) Provide control schematic, elementary diagram, control sequence, description of components, control panel details, legends and schedules in the design.
- (k) All possible “clog” points shall have differential pressure checks on them.
- (l) Connect all HVAC controls to JCI Metasys System. Building Systems shall be fully functional on their own case in case connection to main EMCS is lost.
- (m) Drawings shall identify all confined spaces.

1. Heating

- (1) Designer will research and choose most appropriate heating system for the facility.
- (2) Use ASHRAE Standards for calculating heating loads.
- (3) The use of cast iron boilers is discouraged. Provide boiler water testing sample points on all hot water systems. Provide chemical feeding systems on all hot water heating systems. Provide automatic pilotless ignition systems on all gas fired equipment. Install thermostats

on heating supply and return lines. Install pressure gauges with valves on suction and discharge lines to all pumps. Install gas pressure gauges with valves on all gas trains on boilers.

- (4) Access to equipment for servicing is an extremely important consideration when designing new systems. Coils, filters, valves, pumps or tube removal or servicing is to be considered when designing mechanical systems.
- (5) Sloped roofs shall not have any equipment located on them. All equipment located closer than 10-feet from the edge of a flat roof shall have a safety railing.
- (6) Equipment located on the ground shall be hidden from view (See Landscape Architectural Standards.)
- (7) Where humidification is required, steam humidifiers shall be used.
- (8) The fuels available for use are gas for furnaces and boilers, electric for heat pumps.
- (9) The equipment selection should be based on the system selected to provide the most energy efficient combination.
- (10) Equipment types to be used:
 - (a) Type-1
HVAC boiler shall be steel tube.
Domestic hot water boiler shall be copper tube.
 - (b) Type-2
Heat exchanges shall be shell and tube type or plate type.
 - (c) Type-3
Heat pumps shall be air-to-air or water-to-air.
 - (d) Type-4
Circulating pumps shall be centrifugal base mounted, inline horizontal or vertical.
 - (e) Type-5
Unit heaters shall be horizontal or vertical.
 - (f) Type-6
Air handling units shall be blow thru or draw thru packaged type.
 - (g) Type-7
Fan coil units shall be horizontal, vertical or thru-the-wall type.

- (h) Type-8
Radiant heaters shall be gas fired combination.
- (11) Distribution Piping and/or Ducting
 - (a) Piping and ducting shall be IAW the Uniform Mechanical Code, SMACNA, and applicable ASHRAE design criteria. Flexible duct runs should be limited to 6-foot lengths.
- (12) Insulation
 - (a) All piping installed to serve the building and within the building shall be thermally insulated IAW Table 5.1, ASHRAE Standard 90A-1980, Energy Conservation.
 - (b) No asbestos-containing materials will be used for insulation.
- (13) Heating Plant and Systems
 - (a) Water Softeners/Water Treatment Equipment
 - (i) Make sure water softeners are properly sized to allow soft water to be introduced into the plant at all times, including emergency shutdown.
 - (ii) Provide soft/conditioned water for all large boiler systems.
 - (iii) Install adequate water treatment equipment on boilers/plant. Consideration should be given to pulse type boilers.
- m. Ventilation/Air Conditioning/Refrigeration System
 - (1) Evaporative coolers shall be installed at the 2-foot to 3-foot level, not on the roof. Select air cooled condensers based on 110°F ambient. Avoid the use of centrifugal chillers. A central mechanical system shall normally be provided unless specific engineering cost analysis indicates sub systems to be more economical. Locate equipment designed to operate outside behind architectural screening. Avoid locating outside equipment near the main entry of buildings.
 - (2) A life cycle cost analysis shall be done for air cooled and/or water cooled chillers. Larger air conditioning units work more efficiently with cooling towers. Use of a screw type compressor chiller is more efficient. Centrifugal chillers are long lasting. Based on the above, a life cycle cost analysis shall be done to compare initial costs, long-term costs and energy efficiency.
- (3) Access to equipment for servicing is an extremely important consideration when designing new systems. Removal or servicing of coils, filters, valves, pumps, or tube is to be considered when designing mechanical systems.
- (4) Sloped roofs shall not have any equipment located on them.
- (5) Equipment located on the ground shall be hidden from view. (See Landscape Architectural Standards)
- (6) Fuel: Mechanical refrigeration shall be fueled by electricity.
- (7) Equipment: Shall be suitable for the application.
 - (a) Type-1
Chillers shall be packaged air cooled type or water cooled.
 - (b) Type-2
Evaporative coolers shall be up-blast or vertical discharge closed circuit type or cellulose material impregnated with antirot salt and rigidifying saturants. Media efficiency shall be 76% at 600 FPM face velocity with no entrainment of pad water. Open evaporative coolers shall be designed to provide an indoor temperature of 80°F.
 - (c) Type-3
Heat pumps shall be air-to-air, water-to-air, or geothermal closed loop.
 - (d) Type-4
Circulating pumps shall be centrifugal base mounted, inline horizontal, or vertical.
 - (e) Type-5
Air handling units shall be flow thru or draw thru packaged type.
 - (f) Type-6
Fan coil units shall be horizontal, vertical or thru-the-wall type.

- (8) Office areas, dining rooms, and personnel living spaces shall have air conditioning.
 - (9) Air conditioning system shall be chosen on the basis of economy, efficiency, and ease of maintenance.
 - (10) When calculating cooling loads, use ASHRAE standards.
 - (11) The peak or maximum cooling load for selecting the room side cooling equipment will consist of:
 - (a) exterior heat gain through building construction;
 - (b) personnel occupancy;
 - (c) electrical lighting not to exceed one watt per square foot for rooms and 1½ watts per square foot for office and shop space;
 - (d) design occupancy ventilation air total heat (outside air design minimum room design condition);
 - (e) 10% safety factor.
 - (12) Window shading devices on the exterior and interior will be investigated in an effort to reduce the room solar heat gain.
 - (13) Minimum room supply air rate or fan-coil capacity will be 0.80 cfm/sq. ft.
 - (14) The building peak or block cooling load for central refrigeration capacity will be determined on the identical parameters outlined above with the following exceptions:
 - (a) Personnel occupancy will be 40% total occupancy;
 - (b) No interior electrical lighting;
 - (c) 10% minimum safety factor to include motor hp and heat gain to coolant distribution system.
 - (15) The chilled water supply temperature will normally vary between 40 and 50°F, which shall be determined from the designer's analysis of the optimum balance for the cooling unit, water distribution, and water chiller.
 - (16) Normal air infiltration should be evaluated in an effort to meet the requirement for range hood exhaust.
 - (17) The building peak heat gain analysis will include the personnel ventilation rate or continuous toilet exhaust where the air flows through the occupied space.
 - (18) Provision will be made for removal of equipment for maintenance. Tube bundles will have provision of easy removal for maintenance; i.e., A-frame or monorails structurally adequate to support the loads and provide proper distance between system components and walls to ensure ability to clean, repair, or replace tube bundles.
 - (19) Install bypasses on all strainers so that they may be cleaned without plant shutdown.
 - (20) Distribution Piping and/or Ducting: same as for heating.
 - (21) Design conditions shall be chosen from ASHRAE.
 - (22) Ventilation
 - (a) Ventilation shall be supplied in accordance with ASHRAE.
 - (23) Pipelines/Utilities
 - (a) Access Requirements:
 - (i) Sufficient clearance shall be provided for any conceivable service equipment which may be installed or temporarily operated in the future facility.
 - (b) All crossings must be made by boring or jacking unless a road cut is expressly approved.
 - (c) On approved road cuts, provide spare pipe sleeve for future use.
 - (25) Separation Requirements
 - (a) Design shall meet IAW the Uniform Plumbing Code.
 - (26) Maximum/Minimum Depths of Cover
 - (a) 18-inches minimum for all services at the 5' building line.
 - (b) 30-inch average depth is acceptable on piped utilities.
 - (c) Proper engineering design may allow less depth.
- n. Fire Protection
- (1) Design Development
 - (a) Provide description of fire alarm/suppression system to be utilized, fire water flow rates, connection point, and catalog cuts for proposed equipment.
 - (b) Provide preliminary design, water flow pipe calculations (if sprinkler

- system is proposed), cost estimates and specifications with hydraulic calculations.
- (c) Provide the Base Civil Engineer, Electrical Shop (alarm maintenance section) with training for all Fire Alarm Control Panel (FACP) systems (addressable or non-addressable). Required training includes a demonstration of how to program the FACP, and of how to program each type of addressable device installed within the new facility, such as pull stations, smoke detectors, heat detectors, duct detectors, and control modules used for auto-shutdown of HVAC system.
- (d) Provide at least two copies of installation, programming and user guides for the FACP, and all devices or control modules installed.
- (e) Provide all required proprietary software with license (Win2K compatible), all interface cables, and accessory programming equipment or adapters to be able to program all devices installed in new fire alarm system.
- (2) Response Distance/Time (Mobile Fire Apparatus)
 - (a) Information regarding the base water distribution is available from the Base Civil Engineer.
- (3) Existing Fire Protection System
 - (a) Provide a radio fire alarm transceiver compatible with base fire alarm system which is a D-21 reporting system.
 - (b) Research pressure and flow rate for hydrants in the building area to determine if sufficient capacity exists.
- (4) Compliance with Life Safety Code (NFPA Standard 101)
 - (a) Design for structural, fire protection and occupancy features, including means of egress, roof ventilation, emergency lighting and illumination, and building service (heating, ventilation, and air conditioning systems) shall be IAW the latest edition of NFPA 101.
 - (b) Provide calculations and diagrams showing compliance.
 - (c) Ceiling light in corridors to be used as emergency lighting units with battery backup lights to be near each exit. Exit lights shall have a battery backup.
- (5) Fire Detection System Requirements
 - (a) Manual pull stations shall be provided throughout the facility, typically including one pull station at every personnel exit door.
 - (c) Actuation of a pull station shall sound local alarms and transmit an alarm to the Base Fire Department via the building central control panel.
 - (d) Actuation of a pull station of fire detection system shall indicate both audible and visual signals.
 - (e) This system shall be designed IAW NFPA Standard 72.
 - (f) Smoke/Heat Detectors: Install 135°F fixed temp heat detectors or photoelectric smoke detectors in all areas except dormitory sleeping areas. In dormitory and sleeping areas, install combination smoke/heat detectors.
 - (g) Only the heat detectors component shall be connected to the fire detection systems which transmit a coded signal to a central alarm location.
 - (h) Smoke detectors in sleeping areas shall only activate an audible room alarm. Battery operated units are not permitted.
 - (i) Areas protected by automatic fire detection systems will include occupied and unoccupied spaces and attics.
 - (j) Mechanical rooms, laundry room and attic must be 190°F waterproof where exposed to moisture.

- (k) Design shall comply with applicable NFPA Standards.
- (l) Systems should contain a fan shutdown to turn off all air handlers, exhaust fans, and ventilation motors upon activation. Follow UNC and NFPA requirements.
- (m) Fire alarm panel shall be Monaco M-2 (RF) unit.
- (6) Fire Sprinkler Requirements
 - (a) Provide a fire sprinkler system IAW NFPA 13 for Automatic Systems.
- (7) Special Extinguishing Systems Requirements
 - (a) Provide recessed or semi-recessed cabinets for portable fire extinguisher. Distribution shall be IAW NFPA Standard 10.
- (8) Provisions
 - (a) Fire protection provisions shall be summarized and submitted as a separate analysis.
- (9) Testing
 - (a) Contracts and specifications shall include requirements for all testing and initial charging of systems as part of the construction in accordance with NFPA 13 to produce a complete and usable system.
- (10) Cooking Area Requirements
 - (a) Hood and dust systems for cooking equipment which produces smoke or grease-laden vapors shall comply with NFPA 96, "Installation of Equipment for Removal of Smoke and Grease-laden Vapors from Commercial Cooking Equipment."
 - (b) Activation of the hood and duct fire suppression systems shall automatically de-energize the unit.
 - (c) Activation of the hood and duct fire suppression systems shall sound a general building alarm and transmit a signal to the fire department.
- (11) Handicapped Requirements
 - (a) Designs shall comply with the Americans with Disabilities Act (ADA) and the Uniform Federal Accessibility Standards (UFAS). The most stringent requirements shall apply.

- (12) Meet requirements of UFC 3-600-01, Design: Fire Protection Engineering for Facilities.

A.4 ELECTRICAL

Note: These standards utilize brand names for certain items so that the base can standardize and minimize spare parts.

a. General

- (1) The design of under ground distribution systems shall be based on the calculated demand with sufficient electrical capacity for expansion if allowed or if within the budget.
- (2) The materials as indicated above shall be plastic conduit encased in concrete allowable plastic conduits including PVC, fiberglass, or similar nonmetallic electrical duct.
- (3) Meet requirements of ANSI C2, National Electric Code.

b. High Voltage

- (1) Pad-mounted Transformers
 - (a) No dry type transformers on high voltage.
 - (b) All oil filled transformers must have a certified oil sample on record with the BCE before installation. Oil transformers shall consider FR-3 for fluids.
 - (c) Rebuilt transformers are allowed as they are less expensive and can be delivered more quickly.
 - (d) Specify Copper windings OA/FA, 55/65 Deg C rise, 95KV BIL, with surge arrestors. Aluminum is not allowed.
- (2) Pad-mounted Switches
 - (a) Specify "RTE" RVAC's for inline switching. Joslyns will not be allowed.
 - (b) Specify "RTE" MOST Oil switches for taps.
 - (c) All taps off of a high voltage line shall be switched and fused.
- (3) Fused Cutouts:

- (a) Specify A-B Chance or S & C. All fused cutouts will be porcelain. No fiber types.
- (b) Always require an Aluma-Form or equal aluminum bracket installation for risers and fused cutouts.
- (4) Surge Arrestors:
 - (a) Specify General Electric or Ohio Brass non porcelain type, 9KV.
- (5) Underground Cable
 - (a) Specify Copper, 15KV insulation, 95 KV, 133% BIL, XLP or EPR insulation.
- (6) Concentric Neutral
 - (a) Neutral to be stranded not banded.
- (7) Terminations
 - (a) Specify 3M-5601 shrink on Quick Term or equal.
- (8) Services
 - (a) By regulation all building services will be metered.
- c. Low Voltage
 - (1) Panelboards
 - (a) Specify breakers, no fuses.
 - (b) Square D or GE preferable.
 - (2) Contactors
 - (a) Specify magnetic contactors not manual for a load over ½ hp.
 - (b) Lighting contactor with photocell, locate photocell as high as possible.
 - (c) Motor Starters - always specify thermal protection. Specify with a Hand-Off-Auto switch so the shops can bypass if necessary.
 - (3) Wire
 - (a) All wire larger than #10's shall be stranded copper
 - (b) Indoor and general wiring specify THHN insulation.
 - (c) Outdoor underground wire, specify either XHHW or XLP.
 - (4) Dry Type Transformers:
 - (a) Specify Copper windings, 115 Deg C rise over a 40 Deg C ambient.
 - (5) Outdoor Lighting
 - (a) HPS required by regulation, 250W if possible for parking lights, security lighting, roadway lighting.
 - (6) Fluorescent
 - (a) Indoor office lighting shall be fluorescent except for very specific decorative situations. All lamps to be Type T-8 for new projects with energy efficient ballast.
 - (b) Fluorescent fixtures by regulation shall have solid state ballast. Lamps shall be 32W.
 - (c) Diffusers shall be highly reflective for maximum fixture efficiency.
 - (d) Industrial lighting shall be HPS except for instances where accurate color rendition is a requirement then specify Metal Halide (i.e. inside airplane hangars).
 - (7) All communication connections will be in panel boxes. Do not use plywood on the walls. There shall be no exposed wires.
- d. Interior Lighting
 - (1) Provide wire guards for all open fluorescent lamps. Utilize energy saver 32 watt T-8 fluorescent lamps and electronic ballasts in administrative and similar areas. Use metal halide lights in high bay areas and use T5HO lights in low bay areas (max. height 12-feet). Provide seismic protection for all fixtures, especially ceiling grid mounted fluorescent fixtures. Provide Certified Ballast Manufacturer (CBM) listed ballasts. All ballasts shall have 0.90 power factor or greater. Fixtures shall be 2-foot by 4-foot with recessed parabolic lens.
- e. Wiring Devices:
 - (1) Provide new devices and plates whenever an area is renovated. All devices shall be recessed except in mechanical rooms and utility areas. Provide devices rated at 20 amps where heavy use or electrical load dictates the need for 20 amp devices. All wiring shall be copper. No aluminum allowed.
 - (2) Climactic controllers: Provide battery backup for lawn sprinkler system controllers and automatic setback thermostats.

- (3) Over current Protective Devices: The minimum sized over current device for branch circuits is 20 amps. Ensure proper coordination and withstand ratings for all over current protection devices. Demonstrate coordination with first upstream existing protective device. Replace old circuit breakers with new when remodeling facilities. If replacement breakers are unavailable, consider replacement of entire panelboard. Main fusing is acceptable for limiting short circuit currents; however, place a box with one full set of spare fuses adjacent to main panel.
- (4) Provide plastic panelboard and disconnect labels. Labels shall be laminated (black with white core) engraved with 1/4" high letters. Attach to front exterior of enclosures. Labels shall match plan designations. Provide non-ferrous phase and circuit identification labels in all enclosures for feeder circuit conductors. Provide underground marker tapes for all underground conductors. If underground conductors are not in metallic conduit, provide marker tape with foiled backing to facilitate detection.
- (5) Add power factor (p.f.) capacitors to induction motors (100 HP or larger) to correct p.f. to 0.90 (+ .05, - .00). Switch p.f. capacitors in with the motor. Size capacitor IAW IEEE 141, NEMA MG2 and motor manufacturer recommendations.
- (6) Power requirements for building shall be 208/120 unless building function specifically requires 480/277.
- (7) Balance loads on phases within 10% at all panelboards. Conduit fault calculations to ensure proper withstand ratings for all protective devices. Ensure coordination for all protection devices, conductors, enclosures and equipment.
- (8) Conduit run in concrete shall be PVC
 - (a) unless steel conduit is needed for a specific reason, i.e. to limit fault currents. Underground primary voltage feeders shall be in concrete encased conduit. All penetrations of fire resistance rated walls shall be fire stopped IAW NEC Article 300-21.

Highlight compliance with NEC Articles 300-5 (g) and 300-7 (1) regarding moisture seals.

- (b) All wire shall be copper.

- (9) All new utility lines shall be run in underground conduit, provide spare conduits from transformer to building.
- (10) Meters shall be generally located in rear of building or near service entrance.
- (11) All new building shall have lightning protection designed into the project.

f. Security Systems

- (1) In order to maintain a coordinated system, all control panels must be of the same manufacturer and be compatible and operable within the base networked system.
- (2) All access system components and IDS components and devices shall be compatible with the controls and be the same type, manufacture and function as the other devices used within the base system. All components and devices must be acceptable to the facilities security manager or security system certifier.
- (3) Install a separate power supply in a junction box adjacent to the security panel. Install an 115V AC receptacle in the junction box. The receptacle will be used to plug in the stepdown transformer that powers the security panel.

g. Telecommunications

- (1) Facility construction projects shall meet telecommunications requirements stated in 38th Engineering Installation Group's (38 EIG) Handbook 33-01 and stated in Air Force Instruction (AFI) 32-1021, AFI 32-1023 and ETL 02-12.
- (2) Provide dedicated comm. room per EIA/TIA standards. Dedicate HVAC system for comm. room/thermostat.
- (3) Facility communications rooms shall have HVAC, lighting, dedicated power to racks, cable ladders, data/voice outlets, and 110 VAC outlet for maintenance. Comm. room doors shall have cipher locks. Equipment racks shall be lockable. Multistory facilities shall have a minimum of one comm. room per floor.

- (4) New facility wiring shall be Category 6.
All communications outlets shall be quad outlets. A quad comm. outlet is required for every 100 sq. feet.
- (5) When facilities have multiple communications rooms, the backbone data uplinks shall be multimode fiber. Where a comm. room requires redundant links to another facility, a hybrid single mode and multimode fiber optic cable may be installed. Backbone cable plant shall consist of 62.5/125 or 50/125 12 strand multimode graded-index fiber optic cables.
- (6) Voice outlets shall be terminated to Cat 6 patch panels and collocated with their respective data ports.
- (7) Patch cords and cross connect jumpers shall be rated at same performance category as the cabling it connects.
- (8) All new fiber optic patch panels shall be SC type connectors and mounted in 19-inch racks. Equipment racks shall be equipped with wire management panels.
- (9) Label all communications infrastructure and equipment components IAW approved Labeling Scheme.
- (10) For new construction, communications rooms shall be designed to ANSI/TIA/EIA 569A. For repair projects, comm. rooms shall conform as closely as possible to ANSI/TIA/EIA 569A.
- (11) All abandoned communications cables, voice and data, shall be removed. Reference NEC sections 800.2, 800.52 (B), 800.53 (A), and 800.532 (B) (1). Cable records databases shall be updated as necessary.
- (12) Provide drawing package that accurately depicts network configuration and cable plant.
- (13) Network hardware installations shall support at a minimum 10/100 Mbps to the desktop and be SNMP compliant.



APPENDIX B

Plant List

TREES

Botanical Name <i>Common Name</i>	Description
Acacia greggii <i>Catclaw Acacia</i>	Deciduous. Multi-stem. 10-foot height by 12-foot spread. Fragrant yellow flowers. Thorny twisting branches.
Acacia smallii <i>Sweet Acacia</i>	Semi-deciduous. 20-foot height by 20-foot spread. Fragrant yellow flowers, broad dark green leaves, thorny branches.
Cercidium microphyllum <i>Littleleaf Palo Verde</i>	Deciduous. Single/multi-stem. 20-foot height by 20-foot spread. Bright yellow flowers. Yellow green bark and leaves.
Chilopsis linearis “Lucretia Hamilton” <i>Dwarf Purple Desert Willow</i>	Deciduous. Single/multi-stem. 30-foot height by 30-foot spread. Flower color varies. Shaggy bark and twisting trunk.
Chitalpa tashkentensis “Pink Dawn” <i>Pink Dawn Chitalpa</i>	Deciduous. 25-foot height by 25-foot spread. Pale lavender to pink flowers. Bright green leaves.
Fraxinus velutina coriacea <i>Native Ash</i>	Deciduous. 30-foot height by 20-foot spread. Leathery leaves which turn yellow in fall. Resists heat and drought.
Fraxinus velutina “Rio Grande” <i>Fan-Teby Ash</i>	Deciduous. 25-foot height by 25-foot spread. Large dark green leaves turn golden yellow in late fall.
Laurus Nobilis <i>Grecian Laurel</i>	Evergreen. Single/multi-stem. 20-foot height by 20-foot spread. Aromatic leathery leaves. Clusters of small yellow flowers.
Olea europa “Swan Hill” <i>Swan Hill Fruitless Olive</i>	Evergreen. 25-foot height by 35-foot spread. Fruitless, stiff, leathery gray-green leaves.
Phoenix dactylifera <i>Phoenix Date Palm</i>	20-foot to 60-foot high with 2-foot to 3-foot diameter trunk. Imposing, long, blue-green linear leaves.
Pinus halepensis <i>Aleppo Pine</i>	Evergreen. 70-foot height by 20-foot spread. Thrives in desert heat, drought, and wind.

TREES

Botanical Name <i>Common Name</i>	Description
Pistacia Chinensis <i>Chinese Pistache</i>	Deciduous. 50-foot height by 40-foot spread. Scarlet, crimson, and orange fall colors.
Platanus wrightii <i>Arizona Sycamore</i>	Deciduous. 40-foot height by 40-foot spread. Prickly fruit balls. Blue-white bark. Glossy green leaves.
Populus fremontii <i>Fremont Cottonwood</i>	Deciduous. 50-foot height by 20-foot spread. Bright green foliage turning gold in fall. Rough gray bark.
Prosopis chilensis <i>Chilean Mesquite</i>	Semi-deciduous. 30-foot height by 30-foot spread. Thornless with yellow flower. Used as wind break.
Prunus ceraifera “ Atropurpurea ” <i>Purple-Leaf Plum</i>	Deciduous. Single/multi-stem. 10-foot height by 12-foot spread. Graceful branching
Vitex agnus -castus <i>Chaste Tree</i>	Deciduous. 20-foot height by 25-foot spread. Aromatic lilac flowers. Grey-green narrow leaves.
Washingtonia filifera <i>California Fan Palm</i>	20-foot to 60-foot height with 2-foot to 3-foot diameter trunk. Fan-shaped leaves spread from around top of tree.
Yucca Brevifolia <i>Joshua Tree</i>	Evergreen. 15-foot height by 10-foot spread. Sharp leaves surround trunk and branches. Greenish-white flowers in summer.

SHRUBS/GROUNDCOVERS

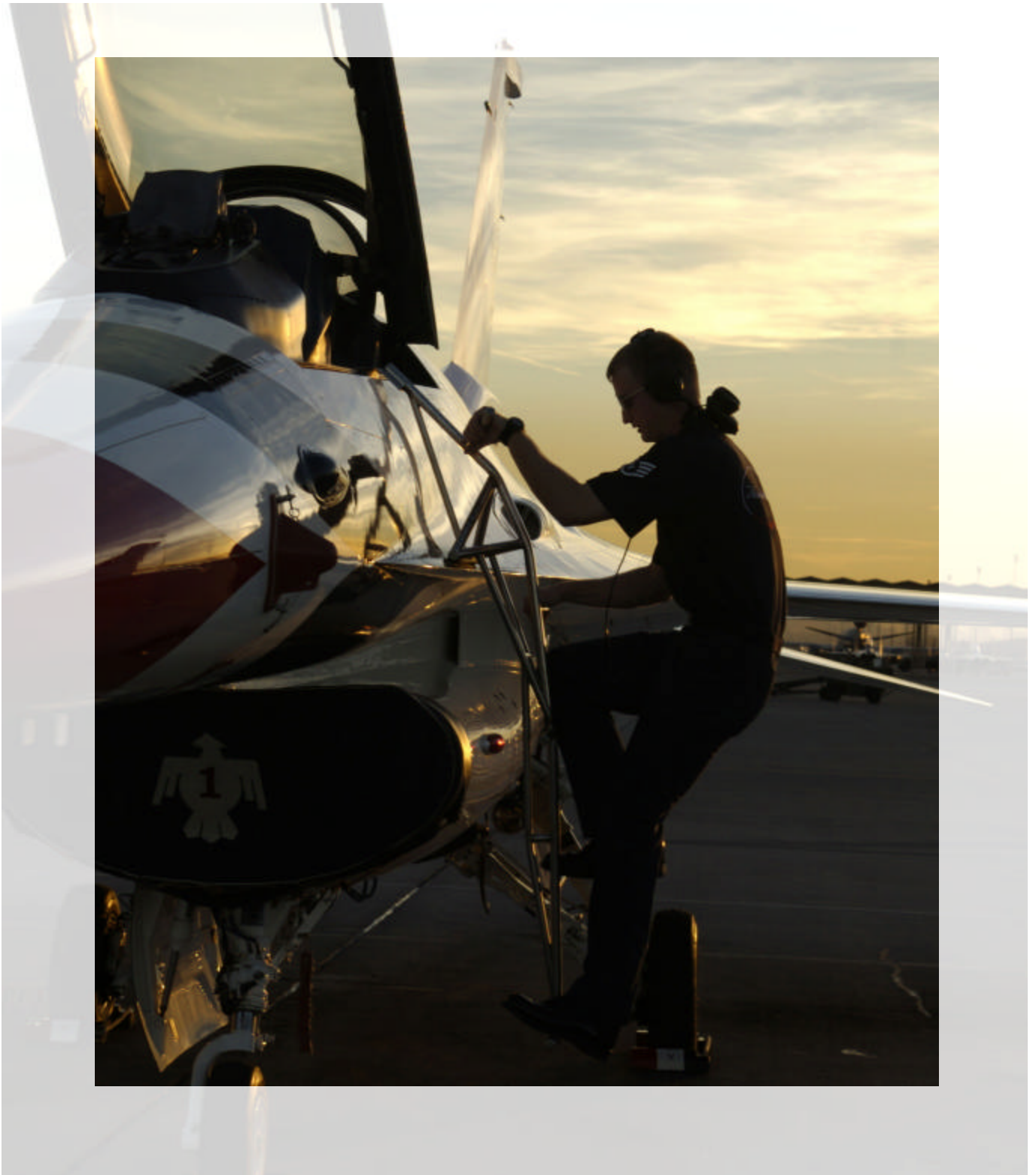
Botanical Name <i>Common Name</i>	Description
Baccharis sarathroides <i>Desert Broom</i>	Evergreen. 5-foot height by 5-foot spread. Bright green, broom-like appearance.
Cassia Artemisioides <i>Feathery Cassia</i>	Evergreen. 6-foot height by 6-foot spread. Grey-green needle-like foliage. Yellow flowers in the spring.
Cotoneaster lactues <i>Red Clusterberry Cotoneaster</i>	Evergreen. 6-foot height by 7-foot spread. Grey-green leaves. Stiff, angled, arching branches. Red berries in the fall.
Dalea pulchra <i>Bush Purple Dalea</i>	Evergreen. 4-foot height by 5-foot spread. Rose-purple flowers. Grey green leaves on spikes.
Encelia farinosa <i>Brittlebush</i>	Deciduous. 5-foot height by 5-foot spread. Yellow flowers. Grey-green foliage.
Larrea tridentata <i>Creosote Bush</i>	Evergreen. 6-foot height by 6-foot spread. White, fuzzy seed balls. Twisted gray branches with bright green leaves.
Leucophyllum candidum “Silver Cloud” <i>Silver Ranger</i>	Evergreen. 4-foot height by 4-foot spread. Silvery foliage. Purple flowers.
Leucophyllum frutescens “Green Cloud” <i>Green Texas Ranger</i>	Evergreen. 4-foot height by 4-foot spread. Green elliptical leaves. Lavender-blue bell-shaped flowers.
Leucophyllum laevigatum <i>Chihuahuan Sage</i>	Evergreen. 6-foot height by 6-foot spread. Bell-shaped flowers. Green elliptical leaves.
Raphiolepis Indica “Ballerina” <i>Ballerina Indian Hawthorn</i>	Evergreen. 3-foot height by 4-foot spread. Dense mounding with rosy-pink flowers
Rosmarinus officinalis <i>Upright Rosemary</i>	Evergreen. 4-foot height by 4-foot spread. Dark gray-green needle-like leaves. Dense upright massing.

SHRUBS/GROUNDCOVER

Botanical Name <i>Common Name</i>	Description
Nandina domestica “Compacta” <i>Dwarf Heavenly Bamboo</i>	Evergreen. 4-foot height by 2-foot spread. Lacy-look with bamboo-like stalks. Oriental effect.
Dolca Greggii <i>Trailing Indigo Bush</i>	Groundcover. 3-foot height by 4-foot spread. Small grey leaves with profuse purple flowers.
Lantana Species “New Gold” <i>New Gold Lantana</i>	Groundcover. 2-foot height by 4-foot spread. Rough, dark green foliage with gold flowers.
Convolvulus cneorum <i>Bush Morning Glory</i>	Ground cover. 3-foot height by 3-foot spread. Silvery-gray leaves with funnel-form white flowers.
Baccharis “Centennial” <i>Cebtebbuak /baccgarus</i>	Ground cover. 3-foot height by 5-foot spread. Dark green, low mounding with tan capsules.
Pyracantha species <i>Firethorn</i>	Evergreen. 7-foot height by 7-foot spread. Dark green leaves with white flowers and orange berries.
Vauquelinia californica <i>Arizona Rosewood</i>	Evergreen. 8-foot height by 8-foot spread. Dark green leather toothed foliage with flower clusters.

ACCENTS

Botanical Name <i>Common Name</i>	Description
Dasyllirion wheeleri <i>Desert Spoon</i>	Evergreen. 5-foot height by 6-foot spread. Long, erect, grey-green rigid leaves.
Hesperaloe parviflora <i>Red Yucca</i>	Evergreen. 2-foot height by 3-foot spread. Stiff grey-green leaves radiating around central base with 4-foot flower stalks.
Muhlenbergia capillaris “Regal Mist” <i>Regal Mist Deer Grass</i>	Ornamental grass with deep green leaves with wispy white seed spikes
Pennisetum setaceum “Rubrum” <i>Ruby Fountain Grass</i>	Ornamental grass with narrow leaves with rosy colored fuzzy seed plumes.
Muhlenbergia rigens <i>Deer Grass</i>	Ornamental grass with deep green leaves with masses of pink to purple flower spikes.
Nolina microcarpa <i>Bear Grass</i>	Ornamental grass with green cascade of long leaves.
Yucca recurvifolia <i>Weeping Yucca</i>	Evergreen. 4-foot height by 4-foot spread. 3-foot stalks of waxy-white lily-like blossoms.
Fouquieria splendens <i>Ocotillo</i>	Ornamental tube-like clusters of flowers in orange to red with small green leaves.
Caesalpinia pulcherrima <i>Red Bird of Paradise</i>	Ornamental dark green foliage with brilliant orange-red and yellow flower clusters.



APPENDIX C

Project Personnel

Project Personnel

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APPENDIX D

References

References

This section contains a list of recommended references. Contractors shall refer to, but not limit their references to, the latest edition of the listed publications.

- A Manual of Recommended Practice, latest edition, American Conference of Governmental industrial Hygienists
- ADAAG, Americans with Disabilities Act Architectural Guidelines
- AFH 32-1084 Facility Requirements Handbook
- AFI 31-101, Volume I, Air Force Physical Security Program
- AFI 31-209 Air Force Resource Protection Program (Chapters, 3, 4, 5)
- AFI 31-209 USAF Resources Protection Program
- AFI 31-210 Air Force Antiterrorism Program
- AFI 32-1010, Land Use Planning, 1 November 1998
- AFI 32-7062, Air Force Comprehensive Planning, 1 October 1997
- AFMAN 32-1071, Vol. 1 force protection requirements for glazing
- AFOSH 9166, General Industrial Operations
- AFPM 32-1097, Sign Standards Pamphlet, 1 November 1997
- Air Force Regulation 91-38
- Americans with Disabilities Act (ADA)
- Americans with Disabilities Act Accessibility Guidelines (ADAAG)
- ANSI/TIA/EIA-568-B and All Addenda, Commercial Building Telecommunications Cabling Standard, 2001 (includes System Testing Requirements)
- ANSI/TIA/EIA-569-A, Commercial Building Standard for Telecommunications Pathways and Spaces
- ANSI/TIA/EIA-598-A, Optical Fiber Cable Color Coding
- ANSI/TIA/EIA-606, Administration Standard for the Telecommunications Infrastructure of Commercial Buildings
- ANSI/TIA/EIA-607, Commercial Building Grounding and Bonding Requirements for Telecommunications
- ASTM—American Society for Testing and Materials—E648—Naval Publications and Forms Center, 5801 Tabor Ave, Philadelphia, PA 19120
- Department of Energy Standards Part 435, Energy Conservation Voluntary Performance Standards for New Buildings
- Development and Maintenance of Traffic Control Device Inventories for DOD Installations
- DoE 435 (Energy conservation performance standard)
- Emerald Book for Equipment Grounding, NFPA-70/NEC, National Electric Code
- Engineering Technical Letter (ETL) 93-1, Construction Signs, 11 March 93
- ETL 93-1, Construction Signs, 11 March 1993
- ETL 94-3, Air Force Carpet Standards
- ETL's 86-8, 86-9, 90-6, 90-9, 91-1, 91-4, 91-5, 93-4, 96-1, 99-12, 00-7, and 01-2
- Factory Mutual Global (FM) (<http://www.fmglobal.com>)
- HQ AFCEE Carpet Selection Handbook
- International Conference of Building Officials
- International Conference of Building Officials, publishers of the Uniform Building Code (UBC), (<http://www.icbo.org>)
- International Organization for Standardization (ISO)
- Manual on Uniform Traffic Control Devices (MUTCD by Federal Highway Administration)
- MIL-HDBK-1008B Fire Protection for Facilities, Engineering, Design, and Construction
- Military Traffic Management Command, Traffic Engineering 7 Highway Safety Bulletin, Traffic Engineering for Better Gates; August 2001

References APPENDIX D

- National Fire Protection Association (NFPA)
(<http://www.nfpa.org>)
- NFPA 101 The Life Safety Code
- NFPA 13 Sprinkler Systems
- NFPA 1500 Standard for Fire Department Occupational Safety and Health Program
- NFPA 17A Standard for Wet Chemical Extinguishing Systems
- NFPA 403 Standard for Aircraft Rescue and Fire Fighting Services at Airports
- NFPA 409 Aircraft Hangars
- NFPA 410 Aircraft Maintenance
- NFPA 70 National Electrical Code
- NFPA 72 Standard for Fire Protection Signaling Systems
- NFPA 72E Automatic Fire Detectors
- NFPA 80 Fire Doors and Windows
- NFPA 96 Standard for Installation of Equipment for the Removal of Smoke and Grease Laden Vapors
- National Institute of Building Sciences (NIBS), producers of the “Construction Criteria Base” (CCB).
(<http://www.nibs.org>):
(<http://www.ccb.org/html/home.html>)
- National Standard Plumbing Code, latest edition
- Occupational Safety & Health Administration (OSHA) (<http://www.osha.gov/comp-links.html>)
- Plant Installation Safety Guide, NESC (ANSI/IEEEC-2), National Electric Safety Code
Society of Fire Protection Engineers, Inc. (SFPE)
(<http://www.sfpe.org>)
- The general Plan Guide and Template, HQ Air Force Center for Environmental Excellence (AFCEE)
- UFAS, Uniform Federal Accessibility Standards
- UFC (Unified Facilities criteria) 4-010-01, DoD Minimum Antiterrorism Standards for Buildings, latest edition
- UFC 3-120-01 Air Force Sign Standard, 6 February 2003
- UFC 4-010-02, DoD Minimum Antiterrorism Standoff Distances for Buildings, 08 October 2003
- Underwriters Laboratories, Inc. (UL)
(<http://www.ul.com/welcome.html>)